EBASCO SERVICES INCORPORATED

EBASCO

Skyway Tower, 400 N. Olive Street, L.B. 80, Dallas, Texas 75201

April 13, 1988
NASA/88-

Mr. Michael Green
NASA Headquarters
300 7th Street, SW
Washington, D.C. 20546

Subject: NASA CONTRACT NO. NASW - 4301
PRELIMINARY ASSESSMENT - JOHNSON SPACE CENTER

Dear Mr. Green:

Enclosed please find the Preliminary Assessment (PA) Report for the Johnson Space Center (JSC) which was revised to address the comments received from NASA-HQ and NASA-JSC. This report includes a summary which identifies areas for additional investigation and the completed PA form. We have appended the supporting documentation. The report also includes a list of the documents we reviewed and the people we interviewed.

Based on our assessment of the information we gathered at JSC, the environmental management program is a well organized operation that has made significant improvements to tighten control on waste management and disposal practices and to minimize the potential risk to the public and environment. Examples of these improvements include the clean closure of the last remaining earthen impoundment (Building 24 Cooling Tower Blowdown) and the establishment of a computerized waste manifest tracking system. The waste minimization practices of recycling, recovery and treatment employed at JSC have promoted the reduction of both, volume and toxicity of routinely generated wastes.

Our assessment did, however, identify areas where we have recommended follow up site inspections in order to determine if an imminent hazard to human health and the environment exists. These areas are identified in the PA Report and discussed further in the attached summary.

We wish to thank the personnel at JSC for their assistance in completing this assignment. Specifically, we recognize the excellent cooperation of Mr. John Herrmann, Chief, Environmental Services Office, and his staff.

If you have any specific questions or concerns, please contact Mr. Stephen Turner at (703) 558-7512.

Sincerely,

ORIGINAL SIGNED BY

Thomas H. Magness, III
Manager of Environmental Projects

Attachments
THM:jsw

9404667

SUMMARY

1.0 Introduction

During the two-day period, 23-24 February 1988, Ebasco Services representatives visited the National Aeronautics and Space Administration (NASA) facility at the Lyndon B. Johnson Space Center (JSC). The purpose of the visit was to complete the Preliminary Assessment (EPA Form 2070-12) and Site Inspection Report (EPA Form 2070-13) EPA requires of Federal facilities listed on the Federal Facilities Docket. Ebasco representatives on site included Mr. Anthony Gardner and Mr. Michael Cruz. Mr. John Herrmann, NASA-JSC Environmental Coordinator, and Mr. Don Moen respresented NASA-JSC.

NASA-JSC is located on a 1620-acre tract in southeast Harris County within the Gulf Coast region of Texas. The site is approximately 25 miles southeast of Houston, Texas and approximately 2.5 miles east of Webster, Texas. The Armand Bayou Nature Center borders the site on the north with Clear Lake and Forest Lake located approximately one-half mile to the northeast. The facility was established in 1964 to coordinate the development, manufacture and operation of the manned space-flight program.

2.0 Areas of Concern

The following areas of concern and data gaps have been identified based on the review of available information:

- o Thermochemical Testing Area (TTA) is a controlled access area located in the northwest quarter of the NASA-JSC. A total of 7 monitor wells were installed within the TTA to ensure that underground storage tanks associated with TTA facilities have not been leaking into the groundwater. In May 1987, Freon 113 (1,1,2,-trichloro-1,2,2-trifluoroethane) was detected at 25.0 ppb in well 36 and 20.0 ppm in well 32; Freon 11 (trichloro-fluoromethane) was detected in well 32 at 33.2 ppb; and trichloro-ethylene was detected in well 32 at 25.6 ppb. The results of two subsequent field investigation programs, soil gas sampling and additional groundwater monitoring confirmed the presence of contaminants in the subsurface beneath the TTA. The results of the soil gas sampling indicated that the contaminants are located very close to an unlined sewer line. In response to these findings, NASA-JSC has initiated additional investigations and corrective action measures for the TTA. The plans for these additional investigations were submitted to the Texas Water Commission (TWC) and the EPA on October 30, 1987. The EPA and TWC have subsequently submitted comments on the plans on or about November 27, 1987 and February 4, 1988, respectively.

- Sand Blast Area, located adjacent to Building 338 is an open area of compacted shell and gravel used to sand blast paint and other protective coatings from equipment. Material safety data sheets indicate the coatings contain lead, chromates, sodium fluoride and titanium dioxide. Analytical results for two surface samples indicated the presence of chromium (29 ppm), lead (97 ppm) and thallium (530 ppm). Additional soil sampling to further characterize this area is recommended.

- Fire Prevention Training Area 324, located within the TTA, north of Building 358 is currently used as a storage facility. In the past, diesel and JP-4 fuels were burned in an unlined earthen pit for fire fighting training. Depth to the groundwater aquifer is approximately 60-70 feet. Laboratory analysis of water from the pit detected no volatile organic compounds above the detection limit. A soil boring and chemical analysis program is recommended for this area.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
NASA Lyndon B. Johnson Space Center	2101 Nasa Road 1				
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 COUNTY**	**07 COUNTY CODE**	**08 CONG DIST**
Houston	TX	77058	Harris	101	07

09 COORDINATES LATITUDE: 293328.N | LONGITUDE: 950521.W

10 DIRECTIONS TO SITE (Starting from nearest public road)

Houston, Texas, south on Interstate Highway 45 to Nasa Road 1 exit, east on Nasa Road 1 approximately 1.6 miles to Main Gate at Johnson Space Center. (See Attachment A-Site Map).

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)			
National Aeronautics and Space Administration	2101 Nasa Road 1			
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 TELEPHONE NUMBER**	
Houston	TX	77058	(713) 483-3120	
07 OPERATOR (If known and different from owner)	**08 STREET** (Business, mailing, residential)			
Same				
09 CITY	**10 STATE**	**11 ZIP CODE**	**12 TELEPHONE NUMBER**	
			( )	

13 TYPE OF OWNERSHIP (Check one)

☐ A. PRIVATE ☒ B. FEDERAL: NASA (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL

☐ F. OTHER: (Specify) ☐ G. UNKNOWN

14 OWNER OPERATOR NOTIFICATION ON FILE (Check all that apply)

☐ A. RCRA 3001 DATE RECEIVED: 08 / 05 / 80 (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (MONTH DAY YEAR) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION

☒ YES ☐ NO DATE 01 / 12 / 88 (MONTH DAY YEAR)

BY (Check all that apply)

☒ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR

☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: (Specify)

CONTRACTOR NAME(S):

02 SITE STATUS (Check one)

☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION

1964 (BEGINNING YEAR) | Present (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Photographic and plating wastes containing heavy metals and cyanide are stored in underground storage tanks. Transformers and capacitors containing PCBs are stored in Building 338. Various solvents are used for degreasing and as paint thinners/strippers. Methyl hydrazine, nitrogen tetraoxide (Attachment B).

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

Groundwater and soil gas sampling has documented subsurface Freon 113 contamination (See Part 3(II)(A). An unconfined sand blasting area is located near Bldg. 338. Sample analysis data from the area is provided in Attachment C. (Section IV(5) continued-Attachment B).

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)

☐ A. HIGH (Inspection required promptly) ☐ B. MEDIUM (Inspection required) ☒ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)			03 TELEPHONE NUMBER
Mr. John Herrmann, Chief	NASA-JSC Environmental Services Office			(713) 483-3120
04 PERSON RESPONSIBLE FOR ASSESSMENT	**05 AGENCY**	**06 ORGANIZATION**	**07 TELEPHONE NUMBER**	**08 DATE**
Mr. Anthony Gardner Mr. Michael Cruz		Ebasco Services Inc.	(214) 978-3185	02 / 29 / 88 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- [X] A. SOLID
- [ ] B. POWDER, FINES
- [X] C. SLUDGE
- [ ] D. OTHER _____ (Specify)
- [ ] E. SLURRY
- [X] F. LIQUID
- [ ] G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

- TONS _____
- CUBIC YARDS _____
- NO. OF DRUMS _____

03 WASTE CHARACTERISTICS (Check all that apply)

- [X] A. TOXIC
- [X] B. CORROSIVE
- [ ] C. RADIOACTIVE
- [X] D. PERSISTENT
- [ ] E. SOLUBLE
- [ ] F. INFECTIOUS
- [X] G. FLAMMABLE
- [ ] H. IGNITABLE
- [X] I. HIGHLY VOLATILE
- [X] J. EXPLOSIVE
- [X] K. REACTIVE
- [ ] L. INCOMPATIBLE
- [ ] M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE	236090	lbs	Cooling Tower Blowdown, Paint
OLW	OILY WASTE			
SOL	SOLVENTS	40,500	lbs	Freon 113, MEK, trichloroethane
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	8670	lbs	PCB, Jet Fuel
IOC	INORGANIC CHEMICALS	12,000	lbs	Hydrazine, batteries(PB, Ni-Cd)
ACD	ACIDS	unkn	gals	Nitric, hydrochloric, sulfuric
BAS	BASES	unkn	gals	Ammonia, Sodium hydroxide
MES	HEAVY METALS	6.6 million	lbs	Photographic, electroplating(1987)

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
MES	Arsenic	7440382	Tanks/Offsite		
MES	Cadmium	7440439	Tanks/offsite		
MES	Silver	7440224	Tanks/offsite/Recovery		
MES	Chromium	7440473	Tanks/offsite		
IOC	Cyanide	57125	Tanks/offsite		
MES	Lead	743991	Tanks/offsite		
IOC	Hydrazine	302012	Tanks/onsite treatment		
OCC	PCB	1336363	Transformers, Capacitors @ Building 338		
ACD	Hydrochloric Acid	7647010	Tanks, Drums		
ACD	Sulfuric Acid	7664939	Tanks, Drums		
ACD	Nitric Acid	7697372	Tanks, Drums		
SOL	Freon 113	76131	Tanks, Drums/Recovery		
SOL	Trichlorofluroethane	75694	Tanks, Drums/Recovery		
SOL	Trichloroethylene	79016	Tanks, Drums/Recovery		
SOL	Methyl Ethyl Ketone	78933	Tanks, Drums/Offsite		

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Hydrochloric Acid	7647010	FDS		
FDS	Sulfuric Acid	7664939	FDS		
FDS	Nitric Acid	7697372	FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

(See Attachment G)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION — 02 [X] OBSERVED (DATE: 2/26/87) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Monitoring wells have been installed around Buildings 227, 9, 17, 358, and in the TTA. No statistically significant increases of indicator parameters detected between upgradient wells and downgradient wells except in the TTA. (See Attachment D). Results of the soil gas sampling (See Attachment B).

01 [ ] B. SURFACE WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Potential exists if groundwater is hydrologically connected to Forest Lake and Clear Lake located NE of NASA JSC. NASA JSC has initiated studies to determine if such a connection exists. Surface water quality sampling is conducted quarterly in the JSC canals and ditches. Samples are analyzed for (See Attachment B).

01 [ ] C. CONTAMINATION OF AIR — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

According to the 1971 MSC Environmental Pollution Control Plan, a potential for nitrogen oxide emissions exists at Building 222 and TTA. See Attachment E for air quality status report.

01 [ ] D. FIRE EXPLOSIVE CONDITIONS — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Potential exists due to the presence of hydrazine. NASA is intimately familiar with the hazards associated with these compounds. Contingency plans for abating a release of these compounds has been in place since the facility's inception.

01 [X] E. DIRECT CONTACT — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

See II(H) Worker Exposure/Injury.

01 [X] F. CONTAMINATION OF SOIL — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 AREA POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Soil gas sampling confirmed the presence of Freon 113 near Building 356. Studies to determine the extent of contamination have been inititated.
See II(M) Unstable Containment of Wastes.

01 [ ] G. DRINKING WATER CONTAMINATION — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged or observed. Potable water source is supplied from surface water (Clear Lake City Water Authority).

01 [X] H. WORKER EXPOSURE/INJURY — 02 [X] OBSERVED (DATE: 6/18/81) — [ ] POTENTIAL — [ ] ALLEGED
03 WORKERS POTENTIALLY AFFECTED: 2 — 04 NARRATIVE DESCRIPTION

High density solvents spilled on two workers as a result of a drum rupture. One worker treated for eye irritation. See copy of incident report in Attachment F.

01 [ ] I. POPULATION EXPOSURE/INJURY — 02 [ ] OBSERVED (DATE: _____) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged or observed.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

01 ☒ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species) In June 1977, a fish fill occurred in Ditch 25, SE of Building 14. Laboratory analyses indicated cyanide poisoning. On May 1, 1980, approximately 100 fish were found dead in Ditch 25, south of radar range. Actual cause of the fish kill unknown.

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES (Spills runoff standing liquids leaking drums) — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION Several spills have occurred involving the Building 24 chromate effluent waste from the cooling tower blowdown. These occurred in June 1976, May 20 and June 9, 1977 and March 22, 1978. The spills and (Attachment B).

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Potential exists due to past spills to drainage ditches and the documented groundwater contamination in the TTA.

01 ☐ P ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

In the past, diesel and JP-4 fuels were burned in an unlined earthen pit in the Fire Prevention Training Area 384. This pit is no longer used for fire training; last used in Fall 1985.

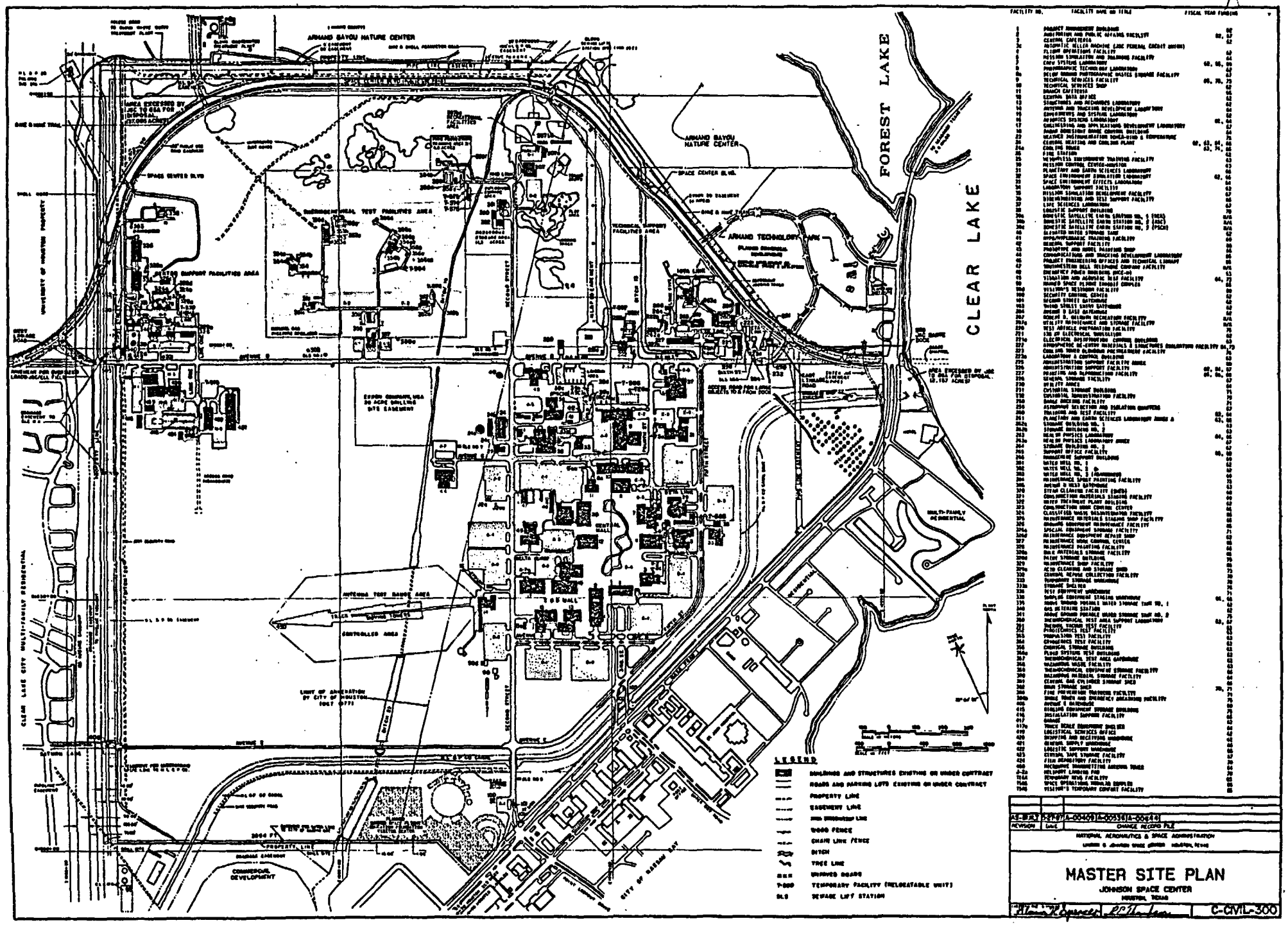
III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

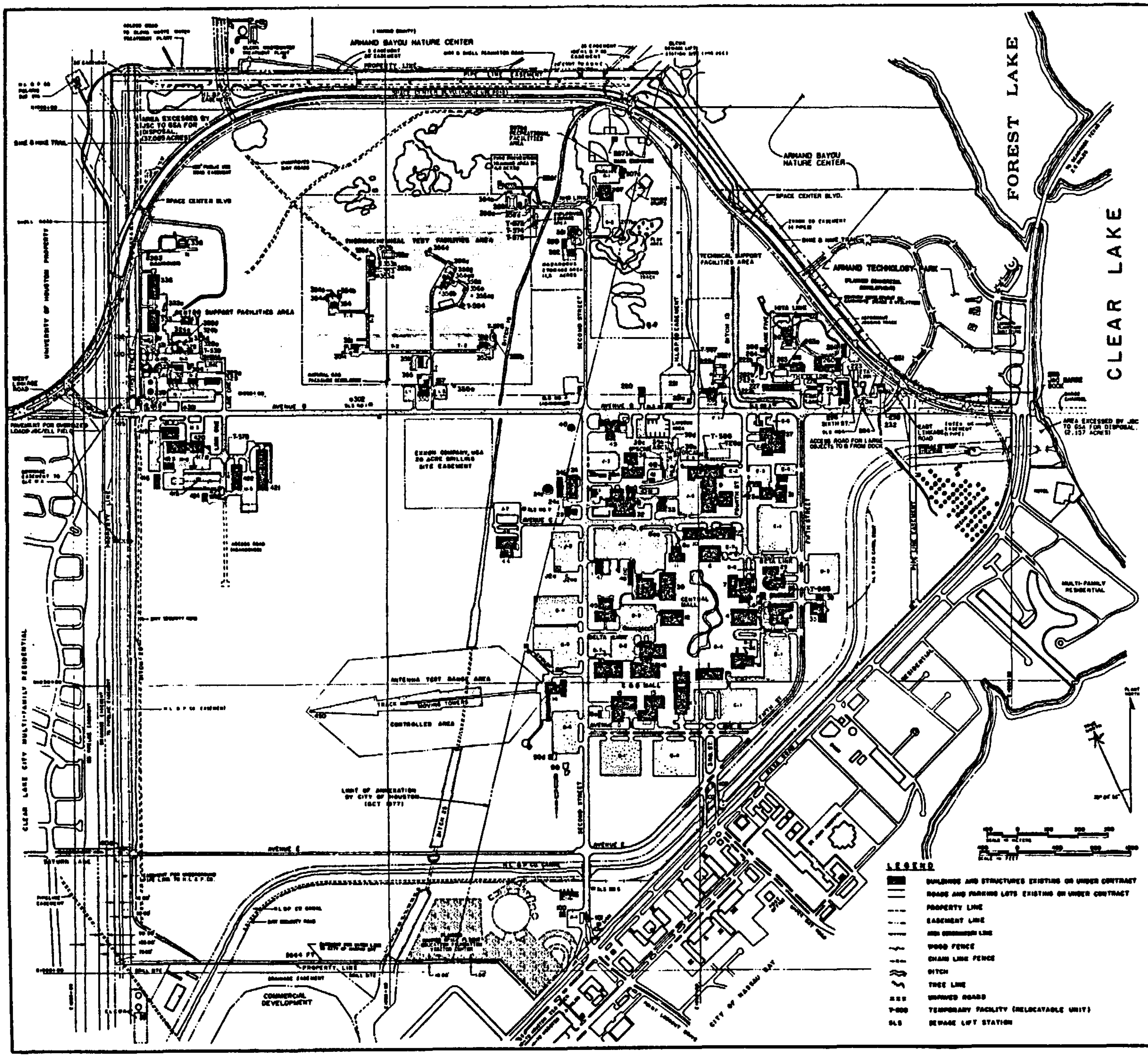
V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

(See Attachment G).

ATTACHMENT A



ATTACHMENT B
Master Site Plan
and
Thermochemical Testing Area



FACILITY NO.	FACILITY NAME OR TITLE	FISCAL YEAR FUNDING
1	PROJECT MANAGEMENT BUILDING	62
2	AUDITORIUM AND PUBLIC AFFAIRS FACILITY	62, 67
3	CENTRAL CAFETERIA	62
3c	AUTOMATIC TELLER MACHINE (JSC FEDERAL CREDIT UNION)	
4	FLIGHT OPERATIONS FACILITY	62
5	MISSION SIMULATION AND TRAINING FACILITY	64
7	CREW SYSTEMS LABORATORY	62, 66, 69
8	PHOTOGRAPHIC TECHNOLOGY LABORATORY	64
8a	BELOW GROUND PHOTOGRAPHIC WASTES STORAGE FACILITY	67
9	TECHNICAL SERVICES FACILITY	66, 70, 73
10	TECHNICAL SERVICES SHOP	62
11	BRANCH CAFETERIA	66
12	CENTRAL DATA OFFICE	62
13	STRUCTURES AND MECHANICS LABORATORY	62
14	ANTENNA AND TRACKING DEVELOPMENT LABORATORY	64
15	EXPERIMENTS AND SYSTEMS LABORATORY	62
16	AVIONICS SYSTEMS LABORATORY	62, 64
17	ENGINEERING AND APPLICATIONS DEVELOPMENT LABORATORY	67
18	RADAR BORESIGHT RANGE CONTROL BUILDING	64
20	WEATHER INSTRUMENTATION TOWER-WIND & TEMPERATURE	73
24	CENTRAL HEATING AND COOLING PLANT	62, 63, 64, 66
24a	COOLING TOWER	63, 70, 66
25	FIRE STATION	62
29	WEIGHTLESS ENVIRONMENT TRAINING FACILITY	63
30	MISSION CONTROL CENTER-HOUSTON	63
31	PLANETARY AND EARTH SCIENCES LABORATORY	65
32	SPACE ENVIRONMENT SIMULATION LABORATORY	62, 66
33	SPACE ENVIRONMENT EFFECTS LABORATORY	64
34	LABORATORY SUPPORT FACILITY	63
35	MISSION SIMULATION DEVELOPMENT FACILITY	67
36	BIOENGINEERING AND TEST SUPPORT FACILITY	66
37	LIFE SCIENCES LABORATORY	67
38	LOGISTIC SUPPORT BUILDING	70
39a	DOMESTIC SATELLITE EARTH STATION NO. 1 (RCA)	N/A
39b	DOMESTIC SATELLITE EARTH STATION NO. 2 (ASC)	N/A
39c	DOMESTIC SATELLITE EARTH STATION NO. 3 (PSCN)	N/A
40	ELEVATED WATER STORAGE TANK	62
41	HYPO/HYPERBARIC TRAINING FACILITY	68
42	GENERAL SUPPORT FACILITY	66
43	PROTOTYPE AND MODEL PAINTING SHOP	66
44	COMMUNICATIONS AND TRACKING DEVELOPMENT LABORATORY	66
45	PROJECT ENGINEERING OFFICES AND TECHNICAL LIBRARY	66
47	SOUTHWESTERN BELL TELEPHONE COMPANY FACILITY	N/A
48	EMERGENCY POWER BUILDING (MCC-H)	63
49	VIBRATION AND ACOUSTIC TEST FACILITY	64, 73
50	MANNED SPACE FLIGHT EXHIBIT COMPLEX	66
50d	VISITOR'S RESTROOM FACILITY	80
100	SECURITY CONTROL CENTER	62
101	SECOND STREET GATEHOUSE	62
103	THIRD STREET ENTRY GATEHOUSE	62
204	AVENUE B EAST GATEHOUSE	62
207	ROBERT R. GILRUTH RECREATION FACILITY	N/A
207a	UTILITY MAINTENANCE AND STORAGE FACILITY	N/A
220	TEST ARTICLE PREPARATION FACILITY	76
221	138 KV ELECTRICAL SUBSTATION	62
221a	ELECTRICAL DISTRIBUTION CONTROL BUILDING	63
222	ATMOSPHERIC RE-ENTRY MATERIALS & STRUCTURES EVALUATION FACILITY	64, 73
223	COOLING TOWER BLOWDOWN PRETREATMENT FACILITY	76
223a	LABORATORY & CONTROL BUILDING	63
225	ADMINISTRATION SUPPORT FACILITY ANNEX	68
226	ADMINISTRATION SUPPORT FACILITY	62, 64, 67
227	PRINTING AND REPRODUCTION FACILITY	66, 66, 68
228	GENERAL STORAGE FACILITY	62
230	UTILITY ANNEX	64
231	CUSTODIAL STORAGE BUILDING	71
232	CUSTODIAL ADMINISTRATION FACILITY	70
250	BARGE DOCKING FACILITY	71
259	ASTRONAUT SELECTION AND ISOLATION QUARTERS	67
260	TRAINING AND TEST FACILITY	63, 66
261	PLANETARY AND EARTH SCIENCES LABORATORY ANNEX A	63, 66
262a	STORAGE BUILDING NO. 1	63
262b	STORAGE BUILDING NO. 2	63
263	HEALTH PHYSICS LABORATORY	64, 66
263a	HEALTH PHYSICS LABORATORY ANNEX	67
264	STORAGE BUILDING NO. 3	67
265	SUPPORT OFFICE FACILITY	66, 68
266	MANAGEMENT SUPPORT BUILDING	69
301	WATER WELL NO. 1	62
302	WATER WELL NO. 2	62
303	WATER WELL NO. 3 (ABANDONED)	60
304	MAINTENANCE SPRAY PAINTING FACILITY	72
305	AVENUE B WEST GATEHOUSE	62
320	STEAM CLEANING FACILITY (SHED)	68
321	CONSTRUCTION MATERIALS STAGING FACILITY	68
322	WATER TREATMENT PLANT BUILDING	62
323	CONSTRUCTION WORK CONTROL CENTER	66
324	CLASSIFIED WASTE DISINTEGRATOR FACILITY	66
325	MAINTENANCE MATERIALS STAGING SHOP FACILITY	66
326	GROUNDS EQUIPMENT MAINTENANCE FACILITY	66
326a	SPECIAL EQUIPMENT STORAGE FACILITY	71
326b	MAINTENANCE EQUIPMENT REPAIR SHOP	63
327	MAINTENANCE WORK CONTROL CENTER	66
328	MAINTENANCE PAINTING FACILITY	66
328a	BULK MATERIALS STORAGE FACILITY	66
328b	PAINT STORAGE BUILDING	70
329	MAINTENANCE SHOP FACILITY	66
329a	ACID CLEANING AND STORAGE SHED	72
332	CENTRAL REFUSE COLLECTION FACILITY	70
333	TEMPORARY STORAGE WAREHOUSE	70
333a	STORAGE SHELTER	75
336	TEST EQUIPMENT WAREHOUSE	71
338	SURPLUS EQUIPMENT STAGING WAREHOUSE	66, 68
339	ABOVE GROUND POTABLE WATER STORAGE TANK NO. 1	62
340	GAS METERING STATION	62
341	ABOVE GROUND POTABLE WATER STORAGE TANK NO. 2	75
350	THERMOCHEMICAL TEST AREA SUPPORT LABORATORY	63, 67
351	THERMAL VACUUM TEST FACILITY	63
352	PYROTECHNICS TEST FACILITY	63
353	PROPULSION TEST FACILITY	63
354	CRYOGENICS TEST FACILITY	63
355	CHEMICAL STORAGE BUILDING	63
356a	FLUID SYSTEMS TEST BUILDING	63
357	THERMOCHEMICAL TEST AREA GATEHOUSE	63
358	HAZARDOUS WASTE FACILITY	63
359	THERMOCHEMICAL EQUIPMENT STORAGE FACILITY	66
380	HAZARDOUS MATERIAL STORAGE FACILITY	64
381	CENTRAL GAS CYLINDER STORAGE SHED	66
382	[illegible] STORAGE SHED	70, 71
384	FIRE PREVENTION TRAINING FACILITY	71
384a	SMOKE TOWER AND EMERGENCY BREATHING FACILITY	76
406	AVENUE E GATEHOUSE	68
415	RIGGING EQUIPMENT STORAGE BUILDING	75
416	INSTALLATION SUPPORT FACILITY	66
417	GARAGE	62
417a	TRUCK SCALE EQUIPMENT SHELTER	64
419	LOGISTICAL SERVICES OFFICE	62
420	SHIPPING AND RECEIVING WAREHOUSE	62
421	GENERAL SUPPLY WAREHOUSE	66
422	LOGISTIC SUPPORT WAREHOUSE	66
423	CENTRAL TAPE STORAGE FACILITY	67
424	FILM REPOSITORY FACILITY	70
450	MICROWAVE TRANSMITTING ANTENNA TOWER	64
J-2a	HELIPORT LANDING PAD	70
T-664	TEMPORARY NEWS FACILITY	83
T-585	SPACE OPERATIONS MODULAR COMPLEX	85
T-586	VISITOR'S TEMPORARY COMFORT FACILITY	86

AS-BUILT	5-27-87	A-00409 A-00536 A-00644
REVISION	DATE	CHANGE RECORD FILE

NATIONAL AERONAUTICS & SPACE ADMINISTRATION

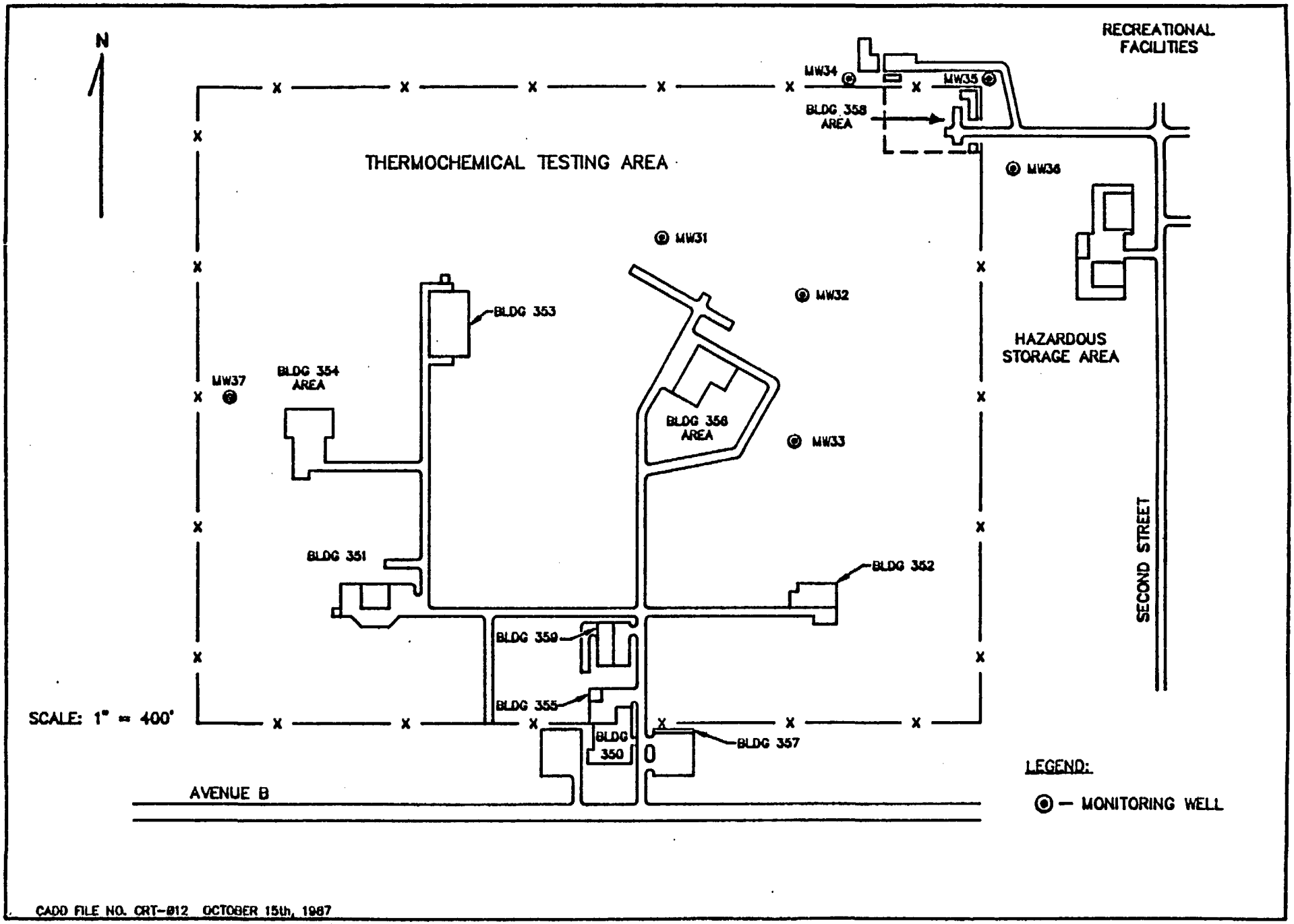
LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS

MASTER SITE PLAN

JOHNSON SPACE CENTER

HOUSTON, TEXAS

C-CIVIL-300



CADD FILE NO. CRT-012 OCTOBER 15th, 1987

ATTACHMENT C
Thermochemical Testing Area
1987 Quarterly Groundwater
Monitoring Reports
NASA-JSC

Note: TTA Monitoring wells not sampled in first quarter 1987.

KELSEY-SEYBOLD
ENVIRONMENTAL HEALTH LABORATORY
ANALYSIS REPORT

DATE: 01-05-1988

REQUESTOR: John Herrmann
MAIL CODE: JJ12

ORGANIZATION: NASA
TELEPHONE: 483-3120

REPORT TO: Charles P. Bergtholdt
MAIL CODE: SD24

ORGANIZATION: NASA
TELEPHONE: 483-7896

Contract: NAS 9-17070
Ground Water Monitoring
Fourth Calender Quarter 1987

APPROVED: Cyril Anderson
Cyril D. Anderson, Laboratory Supervisor

DATE: January 6, 1988

CONCURRENCE: Warren Sproul
W. W. Sproul, Environmental Specialist

DATE: January 7, 1988

INORGANIC PARAMETERS

LOG NUMBER: 9891 WELL NUMBER: 31 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	168.8 ug/l
Zn (Zinc)	8.300 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	12.89 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	406.5 ug/l
Na (Sodium)	102.4 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	0.265	mg/l	1.4-2.4	mg/l
Cl (Chloride)	<100	mg/l	250	mg/l
NO3 (Nitrate)	0.254	mg/l	10	mg/l
SO4 (Sulfate)	<100	mg/l	250	mg/l

ORGANIC PARAMETERS

Log Number:9891 Well Number:31 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9891 Well Number:31 - DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9891 Well Number:31 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9891 Well Number:31 - DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9892

Well Number: 32 Gradient: DOWN

Sampling Date: 11/02/87 Time: 14:50

Water Depth: 11.2 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.5	
Specific Conductance:	600	umhos
TOC:	0.8	mg/l
TOX:	[illegible]	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	0.5	NTU
Gross Alpha:	0.96	pCi/l
Gross Beta :	**11.1**	**pCi/l**

INORGANIC PARAMETERS

LOG NUMBER: 9892 WELL NUMBER: 32 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	8 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	10.94 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	573.0 ug/l
Na (Sodium)	82.83 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.143	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9892 Well Number:32 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	53.995 ug/l
Refrigerant 113/22	8710. ug/l
Methylene Chloride	23.579 ug/l
1,1-Dichloroethane	13.444 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	8.403 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9892 Well Number:32 - DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9892 Well Number:32 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9892 Well Number:32 - DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9893

Well Number: 33 Gradient: DOWN

Sampling Date: 11/03/87 Time: 10:30

Water Depth: 11.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	11.1		
Specific Conductance:	400		umhos
TOC:	0.8		mg/l
TOX:	0.12		mg/l
Cyanide:	<0.05		mg/l
Coliform Bacteria:	0	/100ML	
Turbidity:	24	NTU	
Gross Alpha:	3.13	pCi/l	
Gross Beta :	2.17	pCi/l	

INORGANIC PARAMETERS

LOG NUMBER: 9893 WELL NUMBER: 33 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	< 5.0 ug/l
Zn (Zinc)	5.099 ug/l
Cr (Chromium)	12.5 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	6.5 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	312.1 ug/l
Na (Sodium)	102.1 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	0.14	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9893 Well Number:33 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9893 Well Number:33 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9893 Well Number:33 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9893 Well Number:33 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9894

Well Number: 34 Gradient: DOWN

Sampling Date: 11/03/87 Time: 16:40

Water Depth: 13.2 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	6.8	
Specific Conductance:	600	umhos
TOC:	0.8	mg/l
TOX:	0.01	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	0.9	NTU
Gross Alpha:	<0.70	pCi/l
Gross Beta :	1.93	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9894 WELL NUMBER: 34 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	113.5 ug/l
Zn (Zinc)	68.18 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	96.69 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	204.3 ug/l
Na (Sodium)	96.25 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	0.136	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9894 Well Number:34 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9894 Well Number:34 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9894 Well Number:34 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 3.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	0.141 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9894 Well Number:34 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9895

Well Number: 3S

Gradient: DOWN

Sampling Date: 11/04/87

Time: 10:40

Water Depth: 11.6 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.1	
Specific Conductance:	700	umhos
TOC:	0.7	mg/l
TOX:	0.07	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	1.1	NTU
Gross Alpha:	0.70	pCi/l
Gross Beta :	1.33	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9895 WELL NUMBER: 35 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	113.3 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	48.79 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	227.0 ug/l
Na (Sodium)	106.6 mg/l
Ag (Silver)	< 10 ug/l
Cc (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9895 Well Number:35 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:3895 Well Number:35 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9895 Well Number:35 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-I	5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	**0.139 ug/l**
p,p'-DDD	< 5.0 ug/l
Endosulfan-II	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9895 Well Number:SE DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 3996

Well Number: 36 Gradient: DOWN

Sampling Date: 11/04/97 Time: 15:0[illegible]

Water Depth: 11.3 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.1	
Specific Conductance:	700	umhos
TOC:	0.7	mg/l
TOX:	0.20	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	2.1	NTU
Gross Alpha:	0.96	pCi/l
Gross Beta :	0.82	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9996 WELL NUMBER: 36 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	192.1 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	191.3 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 11 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	244.8 ug/l
Na (Sodium)	111.9 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	0.222	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9596 Well Number:36 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	64.98 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9896 Well Number:33 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9996 Well Number:36 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-I	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	**0.13 ug/l**
p,p'-DDD	< 5.0 ug/l
Endosulfan-II	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9896 Well Number:36 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 3897

Well Number: 37 Gradient: UP

Sampling Date: 11/05/87 Time: 11:50

Water Depth: 11.8 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.3	7.3	7.3	7.3	
Specific Conductance:	500	500	500	500	umhos
TOC:	0.8	0.7	0.7	0.7	mg/l
TOX:	0.19	0.17	0.15	0.17	mg/l
Cyanide:	<0.05	<0.05	<0.05	<0.05	mg/l
Coliform Bacteria:	0	/100ML			
Turbidity:	1.7	NTU			
Gross Alpha:	0.92	pCi/l			
Gross Beta :	0.89	pCi/l			

INORGANIC PARAMETERS

LOG NUMBER: 9897 WELL NUMBER: 37 UP

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	46.34 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	8.300 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	522.9 ug/l
Na (Sodium)	56.87 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05 mg/l
Hg (Mercury)	<1 ug/l

F (Fluoride)	0.816	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.261	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:3897 Well Number:37 UP

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9897 Well Number:37 UP

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9897 Well Number:37 UP

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-I	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	0.160 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-II	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9897 Well Number:37 UP

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

KELSEY-SEYBOLD
ENVIRONMENTAL HEALTH LABORATORY
ANALYSIS REPORT

DATE: 10-12-1987

REQUESTOR: John Herrmann
MAIL CODE: JJ2

ORGANIZATION: NASA
TELEPHONE: 483-3120

REPORT TO: Charles P. Bergtholdt
MAIL CODE: SD24

ORGANIZATION: NASA
TELEPHONE: 483-7896

Contract: NAS 9-17070
Ground Water Monitoring
Third Quarter Report

APPROVED: Cyril Anderson

Cyril D. Anderson, Laboratory Supervisor

DATE: 13 October 1987

CONCURRENCE: Warren Sproul

W. W. Sproul, Environmental Specialist

DATE: October 13, 1987

INORGANIC PARAMETERS

LOG NUMBER: 9098 WELL NUMBER: 31 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	86.05 ug/l
Zn (Zinc)	13.80 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	27.14 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	198.3 ug/l
Na (Sodium)	49.15 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l	
Hg (Mercury)	1	ug/l	
F (Fluoride)	0.104	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9098 Well Number:31 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9098 Well Number:31 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9098 Well Number:31 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9098 Well Number:31 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	**15.226 ug/l**
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

ORGANIC PARAMETERS

Log Number:9098 Well Number:31 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	**15.226 ug/l**
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9099

Well Number: 32 Gradient: DOWN

Sampling Date: 08/01/87 Time: 11:45

Water Depth: 9.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.2	
Specific Conductance:	780	umhos
TOC:	0.6	mg/l
TOX:	8.02	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	<5	NTU
Gross Alpha:	1.13	pCi/l
Gross Beta :	0.91	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9099 WELL NUMBER: 32 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	5.349 ug/l
Zn (Zinc)	10.5 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	18.14 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	269.1 ug/l
Na (Sodium)	39.61 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l	
Hg (Mercury)	<1	ug/l	

F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9099 Well Number:32 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	**35.799 ug/l**
Refrigerant 113/22	**339. ug/l**
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9099 Well Number:32 DCWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9099 Well Number:32 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9099 Well Number:32 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	**17.615 ug/l**
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9100

Well Number: 33 Gradient: DOWN

Sampling Date: 08/01/87 Time: 14:45

Water Depth: 8.7 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	8.5	
Specific Conductance:	500	umhos
TOC:	0.6	mg/l
TOX:	0.48	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	150	NTU
Gross Alpha:	<0.70	pCi/l
Gross Beta :	1.36	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9100 WELL NUMBER: 33 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	5.25 ug/l
Zn (Zinc)	15.19 ug/l
Cr (Chromium)	5 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	54.95 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	101.6 ug/l
Na (Sodium)	37.90 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l		
Hg (Mercury)	2	ug/l		
F (Fluoride)	<0.1	mg/l	1.4-2.4	mg/l
Cl (Chloride)	<100	mg/l	250	mg/l
NO3 (Nitrate)	<0.1	mg/l	10	mg/l
SO4 (Sulfate)	<100	mg/l	250	mg/l

ORGANIC PARAMETERS

Log Number:9100 Well Number:33 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9100 Well Number:33 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9100 Well Number:33 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9100 Well Number:33 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	**6.583 ug/l**
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9101

Well Number: G4 Gradient: DOWN

Sampling Date: 08/04/87 Time: 12:10

Water Depth: 10.4 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.6	
Specific Conductance:	780	umhos
TOC:	0.6	mg/l
TOX:	0.12	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	<3	NTU
Gross Alpha:	<0.70	pCi/l
Gross Beta :	2.43	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9101 WELL NUMBER: 34 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	64.80 ug/l
Zn (Zinc)	14.25 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	30.75 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	109.6 ug/l
Na (Sodium)	51.99 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l	
Hg (Mercury)	1	ug/l	

F (Fluoride)	<0.1	mg/l	1.4-2.4	mg/l
Cl (Chloride)	<100	mg/l	250	mg/l
NO3 (Nitrate)	<0.1	mg/l	10	mg/l
SO4 (Sulfate)	<100	mg/l	250	mg/l

ORGANIC PARAMETERS

Log Number:9101 Well Number:34 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9101 Well Number:34 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9101 Well Number:34 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9101 Well Number:34 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9102

Well Number: 35 Gradient: DOWN

Sampling Date: 08/05/87 Time: 12:05

Water Depth: 10.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.4	
Specific Conductance:	800	umhos
TOC:	0.6	mg/l
TOX:	0.13	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0	/100ML
Turbidity:	<5	NTU
Gross Alpha:	<0.70	pCi/l
Gross Beta :	0.60	pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 9102 WELL NUMBER: 35 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	< 5.0 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	< 5.0 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	107.3 ug/l
Na (Sodium)	50.75 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l	
Hg (Mercury)	1	ug/l	
F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9102 Well Number:35 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9102 Well Number:35 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9102 Well Number:35 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9102 Well Number:35 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9103

Well Number: 36 Gradient: DOWN

Sampling Date: 08/05/87 Time: 09:40

Water Depth: 9.9 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.5		
Specific Conductance:	800		umhos
TOC:	0.70		mg/l
TOX:	0.29		mg/l
Cyanide:	<0.05		mg/l
Coliform Bacteria:	0	/100ML	
Turbidity:	<5	NTU	
Gross Alpha:	<0.70	pCi/l	
Gross Beta :	0.83	pCi/l	

INORGANIC PARAMETERS

LOG NUMBER: 9103 WELL NUMBER: 36 DOWN

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	103.6 ug/l
Zn (Zinc)	11.90 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	112.4 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	133.8 ug/l
Na (Sodium)	60.90 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.05	mg/l	
Hg (Mercury)	2	ug/l	

F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9103 Well Number:36 DOWN

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	**73.48 ug/l**
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9102 Well Number:36 DOWN

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9103 Well Number:36 DOWN

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9103 Well Number:36 DOWN

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

SAMPLING INFORMATION:

Laboratory Log Number: 9104

Well Number: 27 Gradient: UP

Sampling Date: 08/01/87 Time: 9:50

Water Depth: 9.0 ft.

CONTAMINATION PARAMETERS:

Replicates or up gradient wells only.

pH:	6.8	6.8	7.0	7.0	
Specific Conductance:	600	600	600	600	umhos
TOC:	0.8	0.7	0.6	0.6	mg/l
TOX:	0.18	0.13	0.15	0.15	mg/l
Cyanide:	<0.05	<0.05	<0.05	<0.05	mg/l
Coliform Bacteria:	0	/100ML			
Turbidity:	<5	NTU			
Gross Alpha:	<0.70	pCi/l			
Gross Beta :	1.28	pCi/l			

INORGANIC PARAMETERS

LOG NUMBER: 9104 WELL NUMBER: 37 UP

Parameter:	Concentration:
Se (Selenium)	< 10 ug/l
Mn (Manganese)	21.89 ug/l
Zn (Zinc)	< 5.0 ug/l
Cr (Chromium)	< 5.0 ug/l
Pb (Lead)	< 10 ug/l
Fe (Iron)	6.699 ug/l
Ni (Nickel)	< 10 ug/l
Cu (Copper)	< 10 ug/l
As (Arsenic)	< 10 ug/l
Ba (Barium)	268.2 ug/l
Na (Sodium)	28.29 mg/l
Ag (Silver)	< 10 ug/l
Cd (Cadmium)	< 5.0 ug/l
Be (Beryllium)	< 1.0 ug/l

Cr+6 (Hex Chrome)	<0.06	mg/l	
Hg (Mercury)	1	ug/l	

F (Fluoride)	<0.1	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.142	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number:9104 Well Number:37 UP

Analyte	Concentration
Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9104 Well Number:37 UP

Analyte	Concentration
Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9104 Well Number:37 UP

Analyte	Concentration
Alpha-BHC	< 5.0 ug/l
Lindane	< 1.0 ug/l
Beta-BHC	< 5.0 ug/l
Heptachlor	< 5.0 ug/l
Delta-BHC	< 5.0 ug/l
Aldrin	< 5.0 ug/l
Heptachlor Epoxide	< 5.0 ug/l
Endosulfan-1	< 5.0 ug/l
p,p'-DDE	< 5.0 ug/l
Dieldrin	< 5.0 ug/l
Endrin	< 0.1 ug/l
p,p'-DDD	< 5.0 ug/l
Endosulfan-2	< 5.0 ug/l
p,p'-DDT	< 5.0 ug/l
Endrin Aldehyde	< 5.0 ug/l
Endosulfan Sulfate	< 5.0 ug/l
Methoxychlor	< 5.0 ug/l
Toxaphene	< 5.0 ug/l
Chlordane	< 5.0 ug/l
2,4-D	< 5.0 ug/l
Silvex (2,4,5-TP)	< 5.0 ug/l

ORGANIC PARAMETERS

Log Number:9104 Well Number:37 UP

Analyte	Concentration
Aroclor 1016	< 5.0 ug/l
Aroclor 1221	< 5.0 ug/l
Aroclor 1232	< 5.0 ug/l
Aroclor 1242	< 5.0 ug/l
Aroclor 1248	< 5.0 ug/l
Aroclor 1254	< 5.0 ug/l
Aroclor 1260	< 5.0 ug/l
Phenol	< 5.0 ug/l
2-Chlorophenol	< 5.0 ug/l
2-Nitrophenol	< 5.0 ug/l
2,4-Dimethylphenol	< 5.0 ug/l
2,4-Dichlorophenol	< 5.0 ug/l
4-Chloro-3-methylphenol	< 5.0 ug/l
Trichlorophenol	< 5.0 ug/l
2,4-Dinitrophenol	< 5.0 ug/l
4-Nitrophenol	< 5.0 ug/l
2-Methyl-4,6-dinitrophenol	< 5.0 ug/l
Pentachlorophenol	< 5.0 ug/l
Hydrazine	<0.01 mg/l

1

KELSEY-SEYBOLD
ENVIRONMENTAL HEALTH LABORATOY
ANALYSIS REPORT

DATE: 06-25-1987

REQUESTOR: John Herrmann
MAIL CODE: JJ12

ORGANIZATION: NASA
TELEPHONE: 483-3120

REPORT TO: Charles P. Bergtholdt
MAIL CODE: SD24

ORGANIZATION: NASA
TELEPHONE: 483-7896

Contract: NAS 9-17070
Ground Water Monitoring
Second Calender Quarter 1987
22 - WELLS
112 - PAGES

APPROVED: Cyril Anderson
Cyril D. Anderson, Laboratory Supervisor

DATE: June 26, 1987

CONCURRENCE: Warren Sproul
W. W. Sproul, Environmental Specialist

DATE: June 30, 1987

ABBREVIATIONS

MDL - minimum detectable limit

ug/l - microgram per liter

mg/l - milligrams per liter

NTU - nephlometric turbidity unit

N/P - none promulgated

uohms - micro-ohms

pCi/l - picocuries per liter

TOx - total organic halogenated hydrocarbons

78

SAMPLING INFORMATION:

Laboratory Log Number: 8505

Well Number: 31 Gradient: DOWN- 31

Sampling Date. 05/06/87 Time: 08:35

Water Depth: 11.3 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.0	
Specific Conductance:	720	umhos
TOC:	1.0	mg/l
TOX:	0.220	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML	Turbidity: 80 NTU
Gross Alpha.	<0.05 pCi/l	Gross Beta: 10.8 pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 8505 WELL NUMBER: 31 DOWN

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	.16145	mg/l	0.05 mg/l
Zn (Zinc)	.02075	mg/l	1.0 mg/l
Cr (Chromium)	<5	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.04605	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	370.1	ug/l	1,000 ug/l
Na (Sodium)	99.58999	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.667	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.143	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8505 Well Number: 31 DOWN

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8505 Well Number: 31 DOWN

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8505 Well Number: 31 DOWN

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

83

SAMPLING INFORMATION:

Laboratory Log Number: 8506

Well Number: 32 Gradient: DOWN-32

Sampling Date: 05/05/87 Time: 10:30

Water Depth 10.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.3	
Specific Conductance:	720	umhos
TOC:	1.0	mg/l
TOX:	2.53	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML	Turbidity: <5 NTU
Gross Alpha:	<0.05 pCi/l	Gross Beta: 9.0 pCi/l

INORGANIC PARAMETERS

84

LOG NUMBER: 8506 WELL NUMBER: 32 DOWN

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	.01105	mg/l	0.05 mg/l
Zn (Zinc)	.02035	mg/l	1.0 mg/l
Cr (Chromium)	<5	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.0236	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	551.6	ug/l	1,000 ug/l
Na (Sodium)	81.2	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.538	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8506 Well Number: 32 DOWN

85

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	33.179	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
1,1,2-trichloro-1,2,2-trifluoroethane	**20,000.**	**ug/l**
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 6503 Well Number: 32 DOWN

86

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	25.609	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8506 Well Number: 32 DOWN

87

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

88

SAMPLING INFORMATION:

Laboratory Log Number: 8507

Well Number: 33 Gradient: DOWN-33

Sampling Date: 05/05/87 Time: 08:35

Water Depth: 10.8 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	8.2	
Specific Conductance:	610	umhos
TOC:	1.0	mg/l
TOX:	0.763	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML	Turbidity: 325 NTU
Gross Alpha:	<0.05 pCi/l	Gross Beta: <0.05 pCi/l

INORGANIC PARAMETERS

LOG NUMBER: 8507 WELL NUMBER: 33 DOWN

89

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	<0.005	mg/l	0.05 mg/l
Zn (Zinc)	.01395	mg/l	1.0 mg/l
Cr (Chromium)	11.45	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.02575	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	215.9	ug/l	1,000 ug/l
Na (Sodium)	101.2	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.4	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.101	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8507 Well Number: 33 DOWN

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
1,1,2-trichloro-1,2,2-trifluoroethane	<5.	ug/l
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8507

Well Number: 33 DOWN

91

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

92

Log Number: 8507 Well Number: 33 DOWN

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

SAMPLING INFORMATION:

93

Laboratory Log Number: 8508

Well Number: 34 Gradient: DOWN-34

Sampling Date: 05/07/87 Time: 09:00

Water Depth: 11.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.1	
Specific Conductance:	820	umhos
TOC:	0.9	mg/l
TOX:	0.100	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML	Turbidity: <5 NTU
Gross Alpha:	<0.05 pCi/l	Gross Beta: 5.4 pCi/l

INORGANIC PARAMETERS

94

LOG NUMBER: 8508 WELL NUMBER: 34 DOWN

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	.113	mg/l	0.05 mg/l
Zn (Zinc)	.01595	mg/l	1.0 mg/l
Cr (Chromium)	8.649999	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.05445	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	167.4	ug/l	1,000 ug/l
Na (Sodium)	81.895	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.582	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.225	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8508 Well Number: 34 DOWN

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
1,1,2-trichloro-1,2,2-trifluoroethane	<5.	ug/l
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8508 Well Number 34 DOWN

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8508 Well Number: 34 DOWN

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

SAMPLING INFORMATION:

Laboratory Log Number: 8509

Well Number: 35 Gradient: DOWN -35

Sampling Date: 05/07/87 Time: 13:25

Water Depth: 10.2 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.2	
Specific Conductance:	750	umhos
TOC:	0.9	mg/l
TOX:	0.230	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML.	Turbidity: <5 NTU
Gross Alpha:	<0.05 pCi/l	Gross Beta: 10.8 pCi/l

INORGANIC PARAMETERS

99

LOG NUMBER: 8509 WELL NUMBER: 35 DOWN

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	.1296	mg/l	0.05 mg/l
Zn (Zinc)	.0133	mg/l	1.0 mg/l
Cr (Chromium)	9.95	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.05815	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	195.55	ug/l	1,000 ug/l
Na (Sodium)	88.415	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.652	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8509 Well Number: 35 DOWN

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
1,1,2-trichloro-1,2,2-trifluoroethane	<5.	ug/l
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8509 Well Number: 35 DOWN

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8509 Well Number: 35 DOWN

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

ORGANIC PARAMETERS

Log Number: 8509 Well Number: 35 DOWN

102

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

SAMPLING INFORMATION:

Laboratory Log Number: 8510

Well Number: 36 Gradient: DOWN -36

Sampling Date: 05/07/87 Time: 14:50

Water Depth: 10.2 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	7.0	
Specific Conductance:	780	umhos
TOC:	0.9	mg/l
TOX:	0.150	mg/l
Cyanide:	<0.05	mg/l
Coliform Bacteria:	0 /100ML	Turbidity: <5 NTU
Gross Alpha:	<0.05 pCi/l	Gross Beta: 28.8 pCi/l

INORGANIC PARAMETERS

164

LOG NUMBER: 8510 WELL NUMBER: 36 DOWN

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	<0.005	mg/l	0.05 mg/l
Zn (Zinc)	<0.005	mg/l	1.0 mg/l
Cr (Chromium)	<5	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	<0.005	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	<5	ug/l	1,000 ug/l
Na (Sodium)	50.14	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.66	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	<0.1	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8510

Well Number 36 DOWN

Highlighter

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
[redacted]	25.008	ug/l
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8510 Well Number: 36 DOWN

106

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8510 Well Number: 36 DOWN

107

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

SAMPLING INFORMATION:

Laboratory Log Number: 8511

Well Number: 37 Gradient: UP-37

Sampling Date: 05/05/87 Time: 14:25

Water Depth: 10.0 ft.

CONTAMINATION PARAMETERS:

Replicates on up gradient wells only.

pH:	6.9	6.9	6.9	6.9	
Specific Conductance:	600	620	620	620	umhos
TOC:	0.9	0.9	0.9	0.9	mg/l
TOX:	0.49	0.51	0.46	0.53	mg/l
Cyanide:	<0.05	<0.05	<0.05	<0.05	mg/l

Coliform Bacteria: 0 /100ML Turbidity: <5 NTU

Gross Alpha: <0.05 pCi/l Gross Beta: 7.2 pCi/l

INORGANIC PARAMETERS

109

LOG NUMBER: 8511 WELL NUMBER: 37 UP

Parameter:	Concentration:		EPA MCL
Se (Selenium)	<10	ug/l	10 ug/l
Mn (Manganese)	.08055	mg/l	0.05 mg/l
Zn (Zinc)	.02065	mg/l	1.0 mg/l
Cr (Chromium)	<5	ug/l	50 ug/l
Pb (Lead)	<25	ug/l	50 ug/l
Fe (Iron)	.0162	mg/l	0.3 mg/l
Ni (Nickel)	<0.01	mg/l	N/P
Cu (Copper)	<0.01	mg/l	1.0 mg/l
As (Arsenic)	<10	ug/l	50 ug/l
Ba (Barium)	518.05	ug/l	1,000 ug/l
Na (Sodium)	56.45	mg/l	1.0 mg/l
Ag (Silver)	<10	ug/l	50 ug/l
Cd (Cadmium)	<5	ug/l	10 ug/l
Be (Beryllium)	<1	ug/l	N/P
Cr+6 (Hex Chrome)	<0.05	mg/l	0.05 mg/l
Hg (Mercury)	<1	ug/l	2.0 ug/l
F (Fluoride)	0.323	mg/l	1.4-2.4 mg/l
Cl (Chloride)	<100	mg/l	250 mg/l
NO3 (Nitrate)	0.232	mg/l	10 mg/l
SO4 (Sulfate)	<100	mg/l	250 mg/l

ORGANIC PARAMETERS

Log Number: 8511 Well Number: 37 UP

110

Analyte	Concentration	
Chloromethane	< 5.	ug/l
Bromomethane	< 5.	ug/l
Chloroethane	< 5.	ug/l
Trichlorofluoromethane	< 5.	ug/l
Methylene Chloride	< 5.	ug/l
1,1-Dichloroethane	< 5.	ug/l
Chloroform	< 5.	ug/l
1,1,1-Trichloroethane	< 5.	ug/l
Carbon Tetrachloride	< 5.	ug/l
1,2-Dichloroethane	< 5.	ug/l
1,2-Dichloropropane	< 5.	ug/l
Bromodichloromethane	< 5.	ug/l
1,1,2-Trichloroethane	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorodibromomethane	< 5.	ug/l
Bromoform	< 5.	ug/l
1,1,2,2-Trichloroethane	< 5.	ug/l
1,1,2-trichloro-1,2,2-trifluoroethane	< 5.	ug/l
2,2-Dichloropropane	< 5.	ug/l
Chlorobromomethane	< 5.	ug/l
1,3-Dichloropropane	< 5.	ug/l
1,1,2,2-Tetrabromomethane	< 5.	ug/l

ORGANIC PARAMETERS

Log Number: 8511 Well Number: 37 UP

Analyte	Concentration	
Vinyl Chloride	< 5.	ug/l
1,1-Dichloroethylene	< 5.	ug/l
Trans-1,2-Dichloroethylene	< 5.	ug/l
Benzene	< 5.	ug/l
Fluorobenzene	< 5.	ug/l
Difluorobenzene	< 5.	ug/l
Trichloroethylene	< 5.	ug/l
Trans-1,3-Dichloropropene	< 5.	ug/l
Toluene	< 5.	ug/l
Tetrachloroethylene	< 5.	ug/l
Chlorobenzene	< 5.	ug/l
Ethylbenzene	< 5.	ug/l
Meta/Para-Xylene	< 5.	ug/l
Ortho-Xylene	< 5.	ug/l
1,3-Dichlorobenzene	< 5.	ug/l
1,2-Dichlorobenzene	< 5.	ug/l
1,4-Dichlorobenzene	< 5.	ug/l

ORGANIC PARAMETERS

112

Log Number: 8511 Well Number: 37 UP

Analyte	Concentration	
Alpha-BHC	<5.0 ug/l	
Lindane	<1.0 ug/l	4.0 ug/l
Beta-BHC	<5.0 ug/l	
Heptachlor	<5.0 ug/l	
Delta-BHC	<5.0 ug/l	
Aldrin	<5.0 ug/l	
Heptachlor Epoxide	<5.0 ug/l	
Endosulfan-1	<5.0 ug/l	
p,p'-DDE	<5.0 ug/l	
Dieldrin	<5.0 ug/l	
Endrin	<0.1 ug/l	0.2 ug/l
p,p'-DDD	<5.0 ug/l	
Endosulfan-2	<5.0 ug/l	
p,p'-DDT	<5.0 ug/l	
Endrin Aldehyde	<5.0 ug/l	
Endosulfan Sulfate	<5.0 ug/l	
Methoxychlor	<5.0 ug/l	100 ug/l
2,4-D	<5.0 ug/l	100 ug/l
Silvex (2,4,5-TP)	<5.0 ug/l	10 ug/l
Toxaphene	< 5.0 ug/l	5.0 ug/l
Chlordane	< 5.0 ug/l	N/P
Hydrazine	<0.01 mg/l	
Phenol (total)	<6 ug/l	

ATTACHMENT D
Records of Water Wells

TABLE 1

Records of Water Wells within a One Mile Radius
of NASA/JSC
Harris County, Texas

Well No.		Owner
LJ-65-32-	401	NASA Well S-3
	402	NASA Well S-2
	404	NASA Well 1
	405	NASA Well 2
	406	Clear Lake Water Auth. Well 1
	407	Harris Co. WC and ID No. 83 Nassau Bay Well 1
	408	Ms. Carrol
	410	Clear Lake Golf Club
	411	S. M. Houston
	412	Harris Co. WC and ID No. 83 Nassau Bay Well 2
	413	Phillips Petroleum Co.
	414	Graycon Corp.
	415	NASA
	416	Clear Lake Water Authority
	418	Clear Lake Water Auth. Well 5
	419	Clear Lake Water Auth. Well 4
	420	Clear Lake Water Authority
	421	NASA Well 3
	422	Harris Co. WC and ID No. 83 Nassau Bay
	423	H.L. & P. Polaris Substation
	424	Harris-Galveston Coastal Subsidence District
	425	Harris-Galveston Coastal Subsidence District
	426	Harris-Galveston Coastal Subsidence District
	427	Harris-Galveston Coastal Subsidence District
	428	Harris-Galveston Coastal Subsidence District
	501	Harris Co. WC and ID No. 60 El Cary Estates Well 1
	503	NASA Well S-1
	509	M.E. Boehm
	610	J.L. Burns

Table 2

Records of Water Wells within a One Mile Radius
of NASA/JSC
Harris County, Texas

Well No.	Date Completed	Depth of Well (ft)	Aquifer*	Elevation (ft)	Water Level Below Land Surface (ft)	Year of Measurement	Use of** Water	Remarks
LJ-65-32-401	1962	770	E	16	130.7	1962	N	
402	1962	819	-	19	-	-	N	
404	1962	627	CL	22	159	1962	P	
405	1962	629	CL	21	158	1962	P	
406	1962	657	CL	20	156.1	1963	P	
407	1963	680	CL	18	153	1963	P	
408	-	600+	C	18	195.3	1970	N	Well destroyed
410	1963	630	CL	25	168	1963	Irr	
411	1911	490	C	23	43.4	1940	N	Well destroyed
412	1964	620	CL	18	163	1964	P	
413	1963	595	CL	18	158	1963	Ind	
414	1963	611	CL	18	158	1963	P	
415	1962	600	C	21	159.8	1963	N	
					219.3	1971		
416	1962	650	C	20	-	-	N	
418	1969	660	CL	24	199	1969	P	
					209.9	1971		

* Aquifer

C = Chicot
CL = Lower Unit of Chicot
E = Evangeline

** Use of Water

D = Domestic
Ind = Industrial
Irr = Irrigation
N = None
P = Public Supply

References: TDWR Rept 285 (March 1984)
TWDB Rept 178 Vol. II (Jan. 1974)
TWDB Rept 203 (March 1976)

Table 2 (continued)

Records of Water Wells within a One Mile Radius
of NASA/JSC
Harris County, Texas

Well No.	Date Completed	Depth of Well (ft)	Aquifer*	Elevation (ft)	Water Level Below Land Surface (ft)	Year of Measurement	Use of** Water	Remarks
419	1966	635	CL	25	186	1966	Irr	
					213.8	1971		
420	1969	482	CL	15	165	1969	P	
421	1969	615	CL	22	226	1969	P	
422	1969	680	CL	19	207	1969	P	
423	1973	576	CL	20	240	1973	D	
424	1976	1740	E	24	229.5	1976	N	
425	1976	1242	E	24	207.95	1976	N	
426	1976	392	C	24	186.17	1976	N	
427	1976	957	E	24	214.00	1976	N	
428	1976	3072	E	24	136.38	1976	N	
501	1955	600	CL	17	128	1955	P	
503	1962	963	-	15	-	-	N	
509	1926	513	CL	12	-	-	D	
610	1910	527	C	15	51.1	1940	N	Well destroyed

* Aquifer

C = Chicot
CL = Lower Unit of Chicot
E = Evangeline

** Use of Water

D = Domestic
Ind = Industrial
Irr = Irrigation
N = None
P = Public Supply

References: TDWR Rept 285 (March 1984)
TWDB Rept 178 Vol. II (Jan. 1974)
TWDB Rept 203 (March 1976)

ATTACHMENT E
Letters from TWC and EPA

TEXAS WATER COMMISSION

February 4, 1988

Mr. K. B. Gilbreath
Chief, Environmental Services Office
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058

Re: Freon Leak Response
Thermochemical Testing Area
Lyndon B. Johnson Space Center

Dear Mr. Gilbreath:

The staff of the Texas Water Commission (TWC) has reviewed the report entitled "Subsurface Occurrence of Freon 113: Thermochemical Test Area; NASA-Johnson Space Center". This report was submitted on October 30, 1987, and addressed preliminary work conducted to determine the extent of contamination resulting from a 1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113) leak at the above referenced facility.

We concur with your recommendations and schedules of implementation for the proposed source control corrective action, release risk assessment, preliminary remedial investigation, and groundwater treatability study. Accordingly, you should proceed with work elements described above under the proposed schedule of implementation provided as Figure 5 of this report. Following the submittal of the risk assessment results and the final report and recommended work plan, TWC approval should be obtained prior to conducting additional actions proposed under the recommended work plan. The final report and recommended work plan should be submitted by June 15, 1987.

In addition to the comprehensive plans which you have developed in response to this leak, the TWC also recommends that you address the upper sand unit identified at the site. This unit is located at an approximate depth of 12 to 18 feet below land surface and appears to be continuous throughout most of the site. It is our concern that this sand unit may contain higher concentrations of freon than the lower sand zone identified and monitored in your preliminary assessment.

Should you have any questions concerning this approval, please contact David R. Smith of our Enforcement Section at 512/463-8425.

Sincerely,

Samuel B. Pole, Chief
Enforcement Section
Hazardous and Solid Waste Division

DRS/drs

cc: Bill Van Evers - TWC, Deer Park Office
Ken Zarker - TWC, Reports and Management
Jim Highland - EPA Region VI, Federal Facilities Coordinator
T.Y. Richard Lo - Ebasco Services Incorporated, Dallas, Texas

JOHN HERRMANN

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
ALLIED BANK TOWER AT FOUNTAIN PLACE
1445 ROSS AVENUE
DALLAS, TEXAS 75202

NOV 2 7 1987

3 ~~ORIGINAL/ACTION COPY TO~~ JA
Info Copy to AC AC3
Rec'd in Mailroom Nov 30, 1987
Suspense No.

K. B. Gilbreath
Director, Center Operations
Lyndon B. Johnson Space Center
Houston, Texas 77058

Dear Mr. Gilbreath:

#1 As requested the Environmental Protection Agency (EPA) has reviewed the report on the occurrence of Freon 113 in the Thermochemcial Testing Area at NASA Johnson Space Center.

#2 The report did not provide enough information for the EPA to draw any conclusions, however, we feel that the recommendations in the report may be premature.

#3 The depth of the process sewer line was not given so we assumed that it was less than ten feet below the surface. If this is true it would seem unlikely that Freon would migrate through forty feet of silty clay to contaminate the groundwater.

#4 There was no mention of double casing being used for the wells, so there is a possibility that the ten foot sand is contaminated and the installation at the sixty foot sand.

#5 The depth of the soil gas probe was not given. No conclusion can be drawn from the data as to whether the readings are from the ten foot sand or the sixty. Also, the soil gas data is given as 1,1,1 trichloro 2,2,2 trifluoroethane which is inconsistent with the rest of the report.

#6 Two mistakes were noted in the listed MCL's. There is no MCL for sodium. The report uses a MCL of 1 mg/l. Also, the MCL for zinc is 5 mg/l not 1 mg/l.

#7 The EPA's recommendation is to install a shallow well in the ten foot sand to determine if that layer is contaminated. A good location for this well would be in the vicinity of MW-32. A survey of surrounding wells should be taken to determine the use of the 60 foot sand. If no receptors are found, we suggest continued monitoring of all wells.

If you have any questions regarding our review, please contact John Meyer at FTS 255-6730.

Sincerely,

Robert E. Hannesschlager, P.E.
Chief
Superfund Enforcement Branch

ATTACHMENT G

Sources of Information

1) NASA-Johnson Space Center, "Report on Solid Waste Management Units and Assessment of Releases of Hazardous Wastes or Hazardous Constituents", Houston, Texas. (April 2, 1985)

2) A Report Prepared for: NASA-JSC, Houston, Texas, "Waste Minimization"; Prepared by Harding Lawson Associates. (August 12, 1985)

3) A Report Prepared for: NASA-JSC, Houston, Texas, "Waste Minimization 1986"; Prepared by Harding Lawson Associates. (October 1986)

4) NASA-JSC, "Waste Minimization Certification, December 23, 1987"; Prepared by Ebasco Services, Inc.

5) 1987 Annual Waste Summary Report, NASA-JSC Submitted to TWC - (January 20, 1988)

6) Waste Analysis Reports, NASA-JSC: Buildings 8A, 9, 17, 24A and 227. (February 1986 - August 1987)

7) TWC Notice of Registration Solid Waste Management, NASA-JSC: Registration Number 71022.

8) NASA-JSC, "Hazardous Waste Management Procedures, Volume 1, Houston, Texas". (October 1982)

9) Final Part B Permit Application, Volumes 1 and 2, June 1985. Prepared for NASA-JSC by Harding Lawson Associates.

10) N.I. Sax, Dangerous Properties of Industrial Materials, Sixth Edition, Van Nostrand - Reinhold Company; 1984.

11) Facilities Master Plan, LBJ Space Center NASA, Houston, Texas. (September 1980)

12) Subsurface Occurrence of Freon 113 Thermochemical Testing Area, NASA-JSC; Ebasco Services, Inc. (October 19,1987)

13) Interviews with NASA-JSC representatives John P. Herrmann (3 years of service) and Don Moen (20 years of service) on February 24, 1988.

14) Incident Reports, NASA JSC, Pan Am World Services, Inc. (5/1/80 - 12/8/82; 1/13/86 - 10/8/87)

15) Base Line Study of Environmental Conditions, First Quarterly Report. Prepared for NASA, Houston, Texas by Southwest Research Institute. (December 7, 1964)

16) Base Line Study of Environmental Conditions, Second Quarterly Report. Prepared for NASA, Houston, Texas by Southwest Research Institute. (March 26, 1965)

17) Base Line Study of Environmental Conditions, Final Report. Prepared for NASA, Houston, Texas by Southwest Research Institute. (January 4, 1967)

18) MSC Environmental Pollution Control Plan, Volume 1, NASA Manned Spacecraft Center, Houston, Texas. (October 1971)

19) Interview with W.J. Molbert, Director of Utilities, Clear Lake City Water Authority on February 24, 1988.

20) Final Report: The Closure of Blowdown Pretreatment Facility B-24G, Johnson Space Center (Project No. 85999) Prepared for NASA-JSC by Pan Am World Services Inc. (January 1986)

21) Interview with Dowis C. Atkins, Jr., Kelsey-Seybold Clinic (21 years of service) and Glen W. Spencer, NASA-JSC, (24 years of service) on February 12, 1988.

22) Annual Reports: Surface Water Quality (Quarterly) Sampling for NASA-JSC. Prepared by Kelsey-Seybold (Clinic) Medical Support Services.

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

EPA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	880016125

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
NASA-JSC. Thermochemical Testing Area	2101 NASA Road 1				
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 COUNTY**	**07 COUNTY CODE**	**08 CONG DIST**
Houston (Attachment B-Site Map)	TX	77058	Harris	101	07

09 COORDINATES	10 TYPE OF OWNERSHIP (Check one)
LATITUDE 29 33 28.N / LONGITUDE 095 05 21 .W	☐ A. PRIVATE ☒ B. FEDERAL NASA ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
02 / 24 / 88 (MONTH DAY YEAR)	☒ ACTIVE ☐ INACTIVE	1966 (BEGINNING YEAR) / Present (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR _____ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR _____ (Name of firm)
☐ E. STATE ☐ F. STATE CONTRACTOR _____ (Name of firm) ☒ G. OTHER NASA Contractor-Ebasco Services, Inc. (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
Anthony Gardner	Toxicologist	Ebasco	(214) 978-3185
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
Michael Cruz	Environmental Specialist	Ebasco	(214) 978-3164
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED		14 TITLE	15 ADDRESS	16 TELEPHONE NO
John Herrmann,	Environmental Services Office	Chief	NASA-JSC (3 years)	(713) 483-3120
Don Moen,	Environmental Services Office	Environmental Engineer	NASA-JSC (20 years)	(713) 483-3120
James Fowler		Environmental Manager	Pan Am World Services Inc. NASA JSC	(713) 483-5207
W.J. Molbert		Director of Utilities	Clear Lake City Water Auth. 900 Bay Area Blvd., Houston	(713) 488-1164
Dowis Atkins	Environmental Health Services	Director	Kelsey-Seybold (21 years)	(713 483-4111
Glenn Spencer	Facilities Design Div.	Technical Assistant	NASA JSC (24 years)	(713 483-3120

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☒ PERMISSION ☐ WARRANT	10:00 AM	60 F - Clear

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO.
John Herrmann	NASA JSC	(713) 483-3120

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
Anthony Gardner Michael Cruz		Ebasco Services Inc.	214- 978-3185	03 / 02 / 88 (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- [ ] A SOLID
- [ ] B POWDER, FINES
- [ ] C SLUDGE
- [X] E SLURRY
- [X] F LIQUID
- [ ] G GAS
- [ ] D OTHER _____ (Specify)

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS _____

CUBIC YARDS _____

NO OF DRUMS 2

03 WASTE CHARACTERISTICS (Check all that apply)

- [X] A. TOXIC
- [ ] B CORROSIVE
- [ ] C RADIOACTIVE
- [X] D. PERSISTENT
- [ ] E SOLUBLE
- [ ] F. INFECTIOUS
- [ ] G FLAMMABLE
- [ ] H IGNITABLE
- [ ] I. HIGHLY VOLATILE
- [X] J EXPLOSIVE
- [ ] K. REACTIVE
- [ ] L. INCOMPATIBLE
- [ ] M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS	241	gals	Freon 113 (1987)
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	unkn	gals	Methyl Hydrazine
IOC	INORGANIC CHEMICALS	1210	gals	Hydrazine, Nitrogen Tetroxide
ACD	ACIDS	unkn	gals	Hydrochloric, Hydrofluoric
BAS	BASES	unkn	gals	Ethanol, isopropyl alcohol
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	Freon 113	76131	Tanks Drum/Recovery		
IOC	Hydrazine	302012	Tanks		
OCC	Methyl hydrazine	60344	Tanks		
IOC	Nitrogen Tetroxide	10544726	Tanks		
ACD	Hydrochloric	7647101			
ACD	Hydrofluoric	7664393			

V. FEEDSTOCKS (See Appendix for CAS Numbers) N/A

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Hydrochloric Acid	7647010	FDS		
FDS	Hydrogen Fluoride	7664393	FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1) Interview with John Herrmann (NASA) on 2/24/88.
2) 1987 Annual Waste Summary Report, Submitted to TWC by NASA JSC, 1/20/88.
3) Work Plan: Underground Tank Investigation, NASA JSC. Prepared for NASA-JSC by Ebasco Services, Inc. January 1988.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE: TX	02 SITE NUMBER: 8800016125

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION — 02 [X] OBSERVED (DATE: 05/06/87) — ☐ POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Groundwater contamination has been documented in the 1987 quarterly groundwater monitoring reports (Attachment C). Principal contaminant and Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane). (See Part 5.(III) Groundwater).

01 ☐ B. SURFACE WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) — [X] POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Potential exists if groundwater is hydrologically connected to Forest Lake and Clear Lake. NASA-JSC has initiated studies to determine if such a connection exists. Surface water quality sampling is conducted quarterly in JSC ditches and canals. (See Attachment A)

01 ☐ C. CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE: _____) — [X] POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Potential for nitrogen oxide emissions from the bulk fuel burner.

01 ☐ D. FIRE EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE: _____) — [X] POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

Potential exists due to the presence of hydrazine and nitrogen tetroxide. NASA is intimately familiar with the hazards associated with these compounds. Contingency plans for abating a release of these compounds has been in place since the facility's inception.

01 ☐ E. DIRECT CONTACT — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged.

01 [X] F. CONTAMINATION OF SOIL — 02 [X] OBSERVED (DATE: 8-24-87) — ☐ POTENTIAL — ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED: unknown (Acres) — 04 NARRATIVE DESCRIPTION

Soil gas sampling confirmed the presence of Freon 113 near the underground sewer line leading from Bldg. 356 to the treatment impoundment at Bldg. 358. Studies to determine the extent of contamination have been initiated.

01 ☐ G. DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged. Potable Water is supplied from surface water (Clear Lake City Water Authority).

01 ☐ H. WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged.

01 ☐ I. POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE: _____) — ☐ POTENTIAL — ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ — 04 NARRATIVE DESCRIPTION

None alleged.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE: TX	02 SITE NUMBER: 8800016125

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

01 ☐ K. DAMAGE TO FAUNA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

None alleged or observed.

01 ☐ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged.

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES (Spills, Runoff, Standing liquids, Leaking drums) — 02 ☒ OBSERVED (DATE: 8-24-87) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: 0
04 NARRATIVE DESCRIPTION

Results of the soil gas sampling indicated the unlined portion of the sewer at Bldg. 356 may be the source of the subsurface contamination.

01 ☐ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

01 ☒ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Subsurface contamination has been documented along the chemical sewer line leading from Bldg. 356 to treatment impoundment at Bldg. 358 (See II(F) contamination of soil).

01 ☐ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

None alleged or observed.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1) Subsurface occurrence of Freon 113, Thermochemical Testing Area, NASA JSC. Prepared for NASA by Ebasco Services, Inc. October 19, 1987.
2) NASA-Manned Spacecraft Center Environmental Pollution Control Plan, Vol. 1 October 1971.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES				
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☒ E. RCRA INTERIM STATUS	TX8800016125			
☐ F. SPCC PLAN				
☒ G. STATE (Specify) TWC	71022	06-03-82		Solid Waste Registration
☒ H. LOCAL (Specify) State TDH	30706	06-03-82		TX Dept. of Health Regist.
☒ I. OTHER (Specify) Contract for the use of sanitary sewer system				Clear Lake City Water Auth.
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☒ C. DRUMS, ABOVE GROUND	8	drums
☒ D. TANK, ABOVE GROUND	(3) 80	gal
☒ E. TANK, BELOW GROUND	see comment below	
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☒ F. SOLVENT RECOVERY (Bldg 356)
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify)

05 OTHER

☒ A. BUILDINGS ON SITE

9

06 AREA OF SITE

107 (Acres)

07 COMMENTS

Below ground tanks are used for secondary containment for hydrazine, methyl hydrazine and nitrogen tetroxide include, two 150-gallon tanks located at Bldg 353 and 354; 1200-gallon and 1800-gallon tanks located at Bldg 356. The three 80-gallon above ground tanks located at Bldg 356 used for Freon 113 recovery/recycling haye secondary containment.

Note: There are no permitted facilities within the TTA.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☒ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC

Drums are located on the covered concrete loading area of Bldg 356; two drums used for temporary storage of rinse water from Pickling/Passivation Room; one drum of ethyl alcohol, one drum of ispropyl alcohol and a pallet of four drums of Freon 113. The drum storage area has full secondary containment.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE ☐ YES ☒ NO

02 COMMENTS

TTA is a restricted access area.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

1) Final Part B Permit Application, Volumes 1 and 2, June 1985. Prepared by NASA JSC by Harding Lawson Associates.
2) Facilities Master Plan, LBJ Space Center NASA, Houston, Texas (September 1980).
3) Interviews with John Herrmann(NASA) and W.J. Molbert(CLCWA) on 2/24/88.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: TX | 02 SITE NUMBER: 8800016125

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable): (See Attachment A)

	SURFACE	WELL
COMMUNITY	A. ☒	B. ☐
NON-COMMUNITY	C. ☐	D. ☐

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A. ☐	B. ☐	C. ☐
D. ☐	E. ☐	F. ☐

03 DISTANCE TO SITE
A. _____ (mi)
B. _____ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING ☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available) ☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available) ☒ D. NOT USED, UNUSEABLE

(See Attachment A and Attachment D)

02 POPULATION SERVED BY GROUND WATER: unknown

(NASA Well 2)
03 DISTANCE TO NEAREST DRINKING WATER WELL: 0.25 (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIFER
60-70 (ft)	E-NE	60-70 (ft)	Unknown (gpd)	☐ YES ☒ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)
No wells completed in aquifer on concern. Potable water wells in the vicinity are completed in Chicot aquifer (Alto Loma Sands); approx. depths 530'-700'. TTA monitoring wells completed at depths between 80-90'

10 RECHARGE AREA		11 DISCHARGE AREA	
☒ YES ☐ NO	COMMENTS: Surface Infiltration	☒ YES ☐ NO	COMMENTS: Possibly NASA Ditch 19 (Forest Lake Tributary)

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ A. RESERVOIR, RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED POTENTIALLY AFFECTED BODIES OF WATER

NAME: (Note: Not used as a drinking water source)	AFFECTED	DISTANCE TO SITE
Forest Lake (aka Mud Lake)	☐	0.35 (mi)
Clear Lake	☐	0.5 (mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN (See Attachment A)

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 18746 NO OF PERSONS	B. 49040 NO OF PERSONS	C. 66214 NO OF PERSONS

02 DISTANCE TO NEAREST POPULATION: onsite (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE: unknown

04 DISTANCE TO NEAREST OFF-SITE BUILDING: 0.04 (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)
Population is primarily daytime urban workers. Moderately dense residental areas within 1-3 miles of site. Commercial development within vicinity of site includes hotels, restaurants, office buildings and shopping centers. According to the NASA Personnel Office, there are approximately 5,000 daily workers on NASA-JSC.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: TX | 02 SITE NUMBER: 8800016125

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

X A. 10^{-6} - 10^{-8} cm/sec ☐ B 10^{-4} - 10^{-6} cm/sec ☐ C 10^{-4} - 10^{-3} cm/sec ☐ D GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B RELATIVELY IMPERMEABLE (10^{-4} - 10^{-6} cm/sec) ☐ C. RELATIVELY PERMEABLE (10^{-2} - 10^{-4} cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH	
> 10,000 (ft)	unknown (ft)	4.5-8.4	

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE: SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
45 (in)	4 (in)	0.1 %	NNE	2-3 %

09 FLOOD POTENTIAL
TTA is not in a floodplain
SITE IS IN _____ YEAR FLOODPLAIN

10 X SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY
Potential for Hurricanes (June to October)

11 DISTANCE TO WETLANDS (5 acre minimum)
ESTUARINE: A 0.3 (mi) OTHER: B _____ (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)
_____ (mi)
ENDANGERED SPECIES: _____

13 LAND USE IN VICINITY

DISTANCE TO COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS: PRIME AG LAND	AGRICULTURAL LANDS: AG LAND
A 0.5 (mi)	B 0.5 (mi) Armand Bayou Nature Center	C. _____ (mi)	D. _____ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

The Thermochemical Testing Area is a secured, controlled access area within the Johnson Space Center. It is a flat (0.1% slope) and open grassy area with only a few trees in the far NW corner. Ditch 19, which drains to the NNE, crosses the SE corner of the area. The surrounding terrain is very similar with the slope increasing slightly (2-3%) and more trees within the area directly to the north of the site.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports) (See Attachment A)

1) Subsurface Exploration and Monitor Well Installation, JSC, Houston, Texas. Report to Pan Am World Services Inc. by National Soils Services Division. December 1986.
2) Interview with W.J. Molbert, Director of Utilities CLCWA on 2/24/88.
3) Master Site Plan, JSC, Houston, Texas May 27, 1987.
4) Soil Survey of Harris County, Texas. U.S. Soil Conservation Service, August 1976.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
TX	8800016125

II. SAMPLES TAKEN N/A

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER			
SURFACE WATER			
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN N/A

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☒ GROUND ☒ AERIAL

02 IN CUSTODY OF John Herrmann, NASA-JSC
(Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS John Herrmann, NASA-JSC

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

No field data collected.

VI. SOURCES OF INFORMATION (Cite specific references e.g., state files, sample analysis reports)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION
01 STATE: TX | 02 SITE NUMBER: 8800016125

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER	04 SIC CODE
NASA-JSC	TX8800016125	9661

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	05 CITY	06 STATE	07 ZIP CODE
2101 NASA Road 1	Houston	TX	77058

PARENT COMPANY (if applicable)

08 NAME	09 D+B NUMBER	11 SIC CODE

10 STREET ADDRESS (P.O. Box, RFD #, etc.)	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (list most recent first)

01 NAME	02 D+B NUMBER	04 SIC CODE
Rice University		

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	05 CITY	06 STATE	07 ZIP CODE
	Houston	TX	

01 NAME	02 D+B NUMBER	04 SIC CODE
Humble Oil and Refining		

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	05 CITY	06 STATE	07 ZIP CODE
	Houston	TX	

IV. REALTY OWNER(S) (if applicable and list most recent first)

01 NAME	02 D+B NUMBER	04 SIC CODE

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	04 SIC CODE

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1) Facilities Master Plan, LBJ Space Center - NASA, Houston, Texas September 1980.
2) Final Part B Permit Application, Volumes 1 and 2, June 1985. Prepared for NASA-JSC by Harding Lawson Associates.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER
Same	

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
TX	8800016125

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
NASA-JSC	TX8800016125

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
2101 NASA Road 1	9661

05 CITY	06 STATE	07 ZIP CODE
Houston	TX	77058

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1) Facilities Master Plan, LBJ Space Center - NASA, Houston, Texas. (September 1980).
2) Final Part B Permit Application, Volumes 1 and 2, June 1985.
Prepared for NASA-JSC by Harding Lawson Associates.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
TX	8800016125

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ E. CONTAMINATED SOIL REMOVED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ F. WASTE REPACKAGED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ G. WASTE DISPOSED ELSEWHERE — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ H. ON SITE BURIAL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ L. ENCAPSULATION — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ N. CUTOFF WALLS — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ Q. SUBSURFACE CUTOFF WALL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
TX	8800016125

II PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ S. CAPPING/COVERING — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ T. BULK TANKAGE REPAIRED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ U. GROUT CURTAIN CONSTRUCTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ V. BOTTOM SEALED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ W. GAS CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ X. FIRE CONTROL — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ Y. LEACHATE TREATMENT — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ Z. AREA EVACUATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ 1. ACCESS TO SITE RESTRICTED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☐ 2. POPULATION RELOCATED — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION
N/A

01 ☒ 3. OTHER REMEDIAL ACTIVITIES — 02 DATE _____ — 03 AGENCY _____
04 DESCRIPTION

The process sewer line at Building 356 has been plugged at the building, in order to eliminate continued flow into the line. NASA has flushed the line and sampled the effluent; only trace amounts of Freon 113 detected. NASA is in the process of installing slip-liners in the sewer lines and is proceeding with plans for a remedial investigations, risk assessment, source control corrective action and groundwater treatability study. NASA JSC initiated negotiations with EPA and TWC in October 1987 for a remedial investigation of the area.

III. SOURCES OF INFORMATION (Cite specific references e.g., state files, sample analysis reports)

1) Interview with John Herrmann, NASA-JSC on 2/24/88.
2) Subsurface Occurrence of Freon 113, Thermochemical Testing Area, NASA-JSC; Ebasco Services, Inc. (October 19, 1987).

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
TX	8800016125

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☐ NO (See Below)

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY ENFORCEMENT ACTION

The Texas Water Commission (TWC) concurred with the NASA recommendations and schedule of implementation for the proposed source control corrective action, release risk assessment, preliminary remedial investigation and groundwater treatability study. The TWC also recommended that the upper sand unit (12 to 18 feet below land surface) be included in the investigation. The final report is to be submitted to TWC by June 15, 1987.

The Environmental Protection Agency, Region VI recommended that a shallow well (10 feet) be installed in the vicinity of MW-32, a well survey be conducted to determine the use of the 60-foot sand and the contined monitoring of all well.

(See Attachment E)

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1) Letter to Mr. K.B. Gilbreath, NASA-JSC from Mr. S.B. Poel,TWC-Hazardous and Solid Waste Division; February 4, 1988.
2) Letter to Mr. K.B. Gilbreath, NASA-JSC from Mr. R.E. Hannesschlager, EPA-Superfund Enforcement Branch; November 27, 1987.

ATTACHMENT A

Part 3-II(B). Surface Water Contamination (continued)

Samples are analyzed for metals, pH, cyanide, phenol and coliform bacteria. All potentially contaminated runoff from the TTA is carried to a collection facility where it is sampled prior to discharge to the sanitary system.

Part 3-V. Sources of Information (continued)

3) 1987 Quarterly Groundwater Monitoring Reports, NASA JSC. Prepared by Kelsey-Seybold Environmental Health Laboratory (Attachment C).

4) N.I. Sax, Dangerous Properties of Industrial Materials, Sixth Edition, Van Nostrand-Reinhold Company; 1984.

Part 5-II Drinking Water Supply (continued)

The primary source of drinking water for JSC is treated surface water (Lake Houston and Trinity River) supplied by the City of Houston through the Clear Lake City Water Authority. JSC maintains two on-site potable water wells for emergency use only.

Part 5-III. Groundwater (continued)

The aquifer of concern is at a depth of approximately 60' below ground surface. The potential yield is unknown, however, the aquifer is characterized as follows:

Direction of flow = E - NE
Piezometric surface = ±10' below ground surface
Aquifer thickness = ±30 feet
Average transmissivity = 1.67 sg cm/sec
(Source: Natural Soil Services, 1986)

Clear Lake and Forest Lake may be hydraulically connected to the 60' aquifer. No wells are known to be completed in the 60' aquifer in the vicinity of the site (other than site monitor wells).

The potential yield of the primary aquifer of concern is unknown. The transmissivity has been reported as 0.18 sg cm/sec (Harding Lawson, 1985).

Part 5-V. Demographic and Property Information (continued)

o Population with 1 mile radius of JSC Thermochemical Testing Area:

50% of Taylor Lake Village Population	1,867
80% of Nassau Bay Population	5,674
30% of Clear Lake Population	9,784
40% of Webster Population	1,457
	18,746

Attachment A
(Continued)

- Population within 2 mile radius of JSC Thermochemical Testing Area:

100% of Taylor Lake Village Population	3,734
60% of El Lago Population	3,094
90% of Clear Lake Population	29,244
100% of Webster Population	3,643
30% of Seabrook Population	2,232
100% of Nassau Bay Population	7,093
	49,040

- Population within 3 mile radius of JSC Thermochemical Testing Area:

100% of Nassau Bay Population	7,093
100% of Taylor Lake Village Population	3,734
100% of El Lago Population	5,157
100% of Clear Lake Population	32,493
100% of Webster Population	3,643
100% of Seabrook Population	7,440
60% of League City Population	12,511
100% of Clear Lake Shores Population	1,236
	73,307

(Source: Facilities Master Plan, LBJ Space Center NASA, Houston, Texas. September 1980).

Part 5-VIII. Sources of Information (continued)

5) Final Part B Permit Application, Volumes 1 and 2, June 1985. Prepared for NASA-JSC by Harding Lawson Associates.

6) Interviews with John Herrmann and James Fowler on February 24, 1988.

7) Records of Wells, Drillers' Logs, Water-Level Measurements and Chemical Analyses of Groundwater in Harris and Galveston Counties, Texas. 1980-84 U.S. Geological Survey, Open File Report 87-378. 1987.

8) Ground-water Withdrawals and Changes in Ground-water Levels, Ground-water Quality and Land-surface Subsidence in the Houston District, Texas, 1980-84. U.S. Geological Survey, Water-Resources Investigation Report 87-4153. 1987.

9) Personal Contact, Harris-Galveston Coastal Subsidence District, J.C. Holzshuh, Senior Hydrologist, March 1, 1988.

10) Geological Highway Map of Texas, American Association of Petroleum Geologists and U.S. Geological Survey. 1973.

ATTACHMENT B

Part 1 IV(04) continued:

and Freon 113 are generated in the Thermochemical Testing Area (TTA). Cooling tower blowdown containing chromium, copper and zinc is chemically treated in a RCRA-exempt blowdown treatment facility prior to discharging to a POTW. The sludge from the treatment unit is dewatered in concrete beds prior to offsite disposal. The filtrate from the drying beds is returned to the blowdown treatment facility.

Part 1 IV(05) continued:

Diesel and JP-4 fuels were burned in an earthen pit north of Building 358 for fire fighting training. Depth to the groundwater aquifer is between 60-70 feet. This pit is no longer used for fire training. Analytical results of a composite surface soil sample and a surface water sample from this pit are provided in Attachment C. Numerous waste spills have been documented in NASA JSC Incident Reports (See Part 3 II(m)). In the past, Ditch 25 has received spill runoff and the discharge of spent processing solutions and wash water from the Photographic Services Division Laboratory. Controls have been implemented to eliminate waste water discharges to this ditch.

Part 3 II(A) continued:

in the TTA indicated that the subsurface contamination occurs near the Building 356 underground sewer line. NASA-JSC has initiated additional investigations and corrective action measures for the TTA. The plans for these investigations have been submitted to the EPA and the Texas Water Commission.

Part 3 II(B) continued:

metals, pH, cyanide, phenol and coliform bacteria.

Part 3 II(M) continued:

response activities were documented in incident reports. Three spills from the Building 8A hazardous waste tanks occurred on March 18, March 24 and April 3, 1980 from over topping the tanks. Separate incident reports indicated the maximum volume of spilled liquid was between 50 and 100 gallons per incident. The tank at Building 358 used for treating hydrazine waste overflowed on April 4, 1981. See Attachment F for copies of incident (spills) reports obtained from NASA JSC files. Sample analysis data from the Building 338 sand blasting area are provided in Attachment C.

ATTACHMENT C

NASA
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center

ENVIRONMENTAL HEALTH LABORATORY ANALYSIS REQUEST

Requester	Organization	Mail Code	Phone
Don Moen	NASA	JJ2	33119

Sample Description

Type	Offsite Laboratory	Purchase Order Number
Soil		

Identification	Sampling Frequency
B338 paint oven and B358 fire training area	one

~~Location (Bldg. or Area)~~	Collection Date(s)	Date Received
	12-11-87	12-11-87

Analysis Required (Specification Reference)	Results	
HW metals + Hg		
Log No. 1198 Sample No.	Hg 14 µg/Kg	Cd 0.52 µg/g
Source/ Analysis B338 #1 composite south side	Se <0.1 µg/g	Be 0.75 µg/g
	Cr 29 µg/g	Tl 530 µg/g
	Pb 97 µg/g	
H₂O Wt 10.02	As <0.1 µg/g	
Mt Wt 11.46	Ba 165 µg/g	
	Ag <0.1 µg/g	TLC 12-12
HW metals + Hg		
Log No. 1199 Sample No.	Hg 4 µg/Kg	Ag <0.1 µg/g
Source/ Analysis B338 #2 composite sand-dirt pile composite	Se <0.1 µg/g	Cd 0.20 µg/g
	Cr 18.8 µg/g	Be 0.47 µg/g
	Pb 68.8 µg/g	Tl 367 µg/g
H₂O Wt 11.83	As <0.1 µg/g	
Mt Wt 10.21	Ba 115 µg/g	TLC 12-12
HW metals + Hg		
Log No. 1200 Sample No.	Hg 7 µg/Kg	Cd <0.05 µg/g
Source/ Analysis B358 fire training area background composite	Se <0.1 µg/g	Be 0.27 µg/g
	Cr 5.7 µg/g	Tl 4.4 µg/g
	Pb 15 µg/g	
H₂O Wt 10.89	As <0.1 µg/g	
Mt Wt 9.40	Ba 46 µg/g	TLC 12-12
	As <0.1 µg/g	
Log No. Sample No.		
Source/ Analysis		

Priority Requirements: (Check One)	Analyst	Results Requested By: (Date)
☐ Meet Disposal Schedule ☒ Confirm Spill Area Clean ☐ Contract Proposal Pending		12-18-87
☐ Asbestos Handling & Disposal ☐ Clearance Monitoring ☐ Exposure Data	Name/Report Results To: Warren Sproul	
Other: (Specify)	Telephone 36472	Mail Code SD23
Laboratory Reviewer 12/14/87	Log Nos. 1198 through 1200	

JSC Form 1396 (Rev Mar 87) NASA-JSC

NASA

National Aeronautics and Space Administration
Lyndon B. Johnson Space Center

ENVIRONMENTAL HEALTH LABORATORY ANALYSIS REQUEST

Requester	Organization	Mail Code	Phone
Don Moen	NASA	JJ 2	33119

Sample Description

Type: Containment Water	Offsite Laboratory	Purchase Order Number
Identification: fire pit	Sampling Frequency: once	
Location (Bldg or Area): B358 (north of)	Collection Date(s): 12-11-87	Date Received: 12-11-87

Analysis Required: (*Specification Reference*) HW metals + Hg + [illegible]

Results: The 12-11

Log No. ______ Sample No ______

Source/ Analysis: B358 fire training pit VOA's

Log No ______ Sample No. ______

Source/ Analysis

Log No ______ Sample No. ______

Source/ Analysis

Log No. ______ Sample No. ______

Source/ Analysis

Priority Requirements: (*Check One*)

- [X] Meet Disposal Schedule
- [ ] Confirm Spill Area Clean
- [ ] Contract Proposal Pending
- [ ] Asbestos Handling & Disposal
- [ ] Clearance Monitoring
- [ ] Exposure Data

Other: (*Specify*) [illegible]

Analyst:

Results Requested By: (*Date*) 12-18-87

Name - Report Results To: Warren Sprowl

Telephone	Mail Code	Date Reported
36472	SD23	

Laboratory Supervisor: [signature] 12/14/87

Log Nos. ~~[illegible]~~ 1197 through —

JSC Form 1396 (Rev Mar 87) NASA-JSC

KELSEY SEYBOLD
ENVIRONMENTAL HEALTH LABORATORY
ANALYSIS REPORT

Requestor:	Oganization:	Mail Code:	Telephone:
DON MOEN	NASA	JJ2	483-3119

Sample Description

Sample Type:	Source:
CONTAINMENT WATER	B358 FIRE PIT

Collection Date:	In-Lab Date:
12-11-87	12-11-87

SAMPLE ANALYSIS ATTACHED

Report To:	Organization:
WARREN SPROUL	KELSEY-SEYBOLD

Mail Code:	Telephone:
SD23	483-6472

APPROVAL: _____ 12/14/87 _____ LAB SUPERVISOR

Laboratory Log #1197

Se (Selenium)	<0.05 mg/l
Mn (Manganese)	0.022 mg/l
Zn (Zinc)	0.015 mg/l
Cr (Chromium)	<0.01 mg/l
Pb (Lead)	<0.05 mg/l
Fe (Iron)	0.484 mg/l
Ni (Nickel)	<0.01 mg/l
Cu (Copper)	<0.01 mg/l
As (Arsenic)	0.079 mg/l
Ba (Barium)	<0.01 mg/l
Ag (Silver)	<0.05 mg/l
Cd (Cadmium)	<0.01 mg/l
Be (Beryllium)	<0.001 mg/l
Tl (Thallium)	<0.07 mg/l
Hg (Mercury)	<2 ug/l

Laboratory Log#1197

Vinyl Chloride	< 5.0 ug/l
1,1-Dichloroethylene	< 5.0 ug/l
Trans-1,2-Dichloroethylene	< 5.0 ug/l
Benzene	< 5.0 ug/l
Fluorobenzene	< 5.0 ug/l
Difluorobenzene	< 5.0 ug/l
Trichloroethylene	< 5.0 ug/l
Trans-1,3-Dichloropropene	< 5.0 ug/l
Toluene	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorobenzene	< 5.0 ug/l
Ethylbenzene	< 5.0 ug/l
Meta/Para-Xylene	< 5.0 ug/l
Ortho-Xylene	< 5.0 ug/l
1,3-Dichlorobenzene	< 5.0 ug/l
1,2-Dichlorobenzene	< 5.0 ug/l
1,4-Dichlorobenzene	< 5.0 ug/l

Laboratory Log#1197

Chloromethane	< 5.0 ug/l
Bromomethane	< 5.0 ug/l
Chloroethane	< 5.0 ug/l
Trichlorofluoromethane	< 5.0 ug/l
Refrigerant 113/22	< 5.0 ug/l
Methylene Chloride	< 5.0 ug/l
1,1-Dichloroethane	< 5.0 ug/l
Chloroform	< 5.0 ug/l
1,1,1-Trichloroethane	< 5.0 ug/l
Carbon Tetrachloride	< 5.0 ug/l
1,2-Dichloroethane	< 5.0 ug/l
1,2-Dichloropropane	< 5.0 ug/l
Bromodichloromethane	< 5.0 ug/l
1,1,2-Trichloroethane	< 5.0 ug/l
Tetrachloroethylene	< 5.0 ug/l
Chlorodibromomethane	< 5.0 ug/l
Bromoform	< 5.0 ug/l
1,1,2,2-Tetrachloroethane	< 5.0 ug/l

Medical Support Services
NASA-Johnson Space Center
Houston, Texas 77058
713/483-4111

JSCGW47

4 of 8

Monitoring Result 1st Qr

Kelsey-Seybold Clinic, P.A.

APR 16 1987

SD23(I)
ES-87-22

ATTACHMENT D

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: First Quarterly Report for Groundwater Monitoring Program, January, February, March 1987, NASA/JSC.

In accordance with the JSC Part B Application for a hazardous waste permit, samples were collected from fifteen (15) wells placed around the waste storage tanks at Buildings 227, 9, 8a, 17. Seven (7) new wells in the Building 358 and TTA areas were not monitored because access roadways have not been installed. The samples were analyzed for potability parameters, groundwater quality indicators, JSC site specific parameters and toxic organic pollutants (EPA priority pollutants). Results are attached.

Priority pollutants and three (3) turbidity measurements were analyzed by PSI Laboratories. All other analyses were performed by EHS. Specific conductance, pH and hydrazine were measured in the field with portable instruments. Water depth was measured in each well and the well headspace was tested for aromatic hydrocarbons using MSA detector tubes (none were found) prior to well purging. Each well was purged at least three (3) casing volumes of water (below the miser) before sampling.

The upgradient wells were analyzed for all priority pollutants. Downgradient wells were checked for volatile priority pollutants during trihalomethane analysis. All wells were tested for pesticides and herbicides. The actual turbidity readings of tested wells will be listed with the other wells designated less than 5 NTU by visual inspection.

Endrin and methoxychlor were detected in small amounts in monitoring wells (M.W.) 4 and 14 and Silvex (2, 4, 5T-P) was detected in M.W. 11 and 12.

Of significant importance, trichloroethylene was detected in M.W. 12 and 11 downgradient from the 8a tanks. The higher concentration was in M.W. 12 (the nearer well). The sampling depths of these wells is

Subject: First Quarterly Report for Groundwater Monitoring Program, January, February, March 1987, NASA/JSC.

slightly less than 80 feet and the ground strata in that area has approximately 50 feet of low permeability clay overlay. Further investigation should be made of possible contamination sources.

Dowis C. Atkins, Jr.

DCA/WWS/js

Distribution:

SD22/Walter R. Hein, M.D.
JJ12/John Herrmann (2)

Files (8)

JSC#

KS Medical Support Services

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Houston, Texas 77058
713/483-4111

Monitor. Results 2

Kelsey-Seybold Clinic, P.A.

JUL 9 1987

SD23(I)
ES-87-40

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: Second Quarterly Report for Groundwater Monitoring Program, April, May, June 1987, NASA/JSC.

In accordance with the JSC Part B Application for a hazardous waste permit, samples were collected from twenty-two (22) wells placed around waste storage tanks at Buildings 227, 9, 8a, 17, Thermochemical Test Area (TTA) and 358 waste storage area. The seven (7) new wells in TTA and 358 areas were accessible at the time of sampling so they were monitored for all parameters for the first time. All wells were analyzed for potability, groundwater quality indicators, JSC site specific parameters and toxic organic pollutants. Results are attached.

EPA Priority Pollutants were done on four (4) upgradient wells only by PSI Laboratories. Five (5) turbidity measurements were made by PSI on wells which appeared to be over 5 NTU turbidity. All other analyses were performed by EHL. Specific conductance, pH, temperature and hydrazine were measured in the field with portable instruments. Water depth was measured in each well and the well headspace was tested for aromatic hydrocarbons using MSA detector tubes (none were found) prior to well purging. Each well was purged at least three (3) casing volumes of water (below the miser) before sampling.

Upgradient wells were analyzed for all priority pollutants and downgradient wells were checked for volatile priority pollutants only during trihalomethane analysis. All wells were tested for pesticides and herbicides. The actual turbidity reading of tested wells are listed with the other wells designated less than 5 NTU by visual inspection.

Trichloroethylene was detected again in M.W. 11 and M.W. 12 in approximately the same concentrations as the first quarterly sampling. Refrigerant (1,1,2-trichloro-1,2,2-trifluoroethane) 113 was detected in M.W. 13, also in low concentration. Small amounts of total chromium were detected in several of the new downgradient wells (M.W. 33, 34 and 35). Monitor Well 32 in TTA area contained a substantial amount of refrigerant 113 (20,000 ug/l).

SD23(I)
ES-87-40

Subject: Second Quarterly Report for Groundwater Monitoring Program, April, May, June 1987, NASA/JSC.

This contamination appears to have significantly increased the TOx of this well over other wells in the area. Small concentrations of other chlorinated hydrocarbons were also detected in M.W. 32. A small amount of Refrigerant 113 was also found in M.W. 36. All other parameters appear at usual concentrations for all wells.

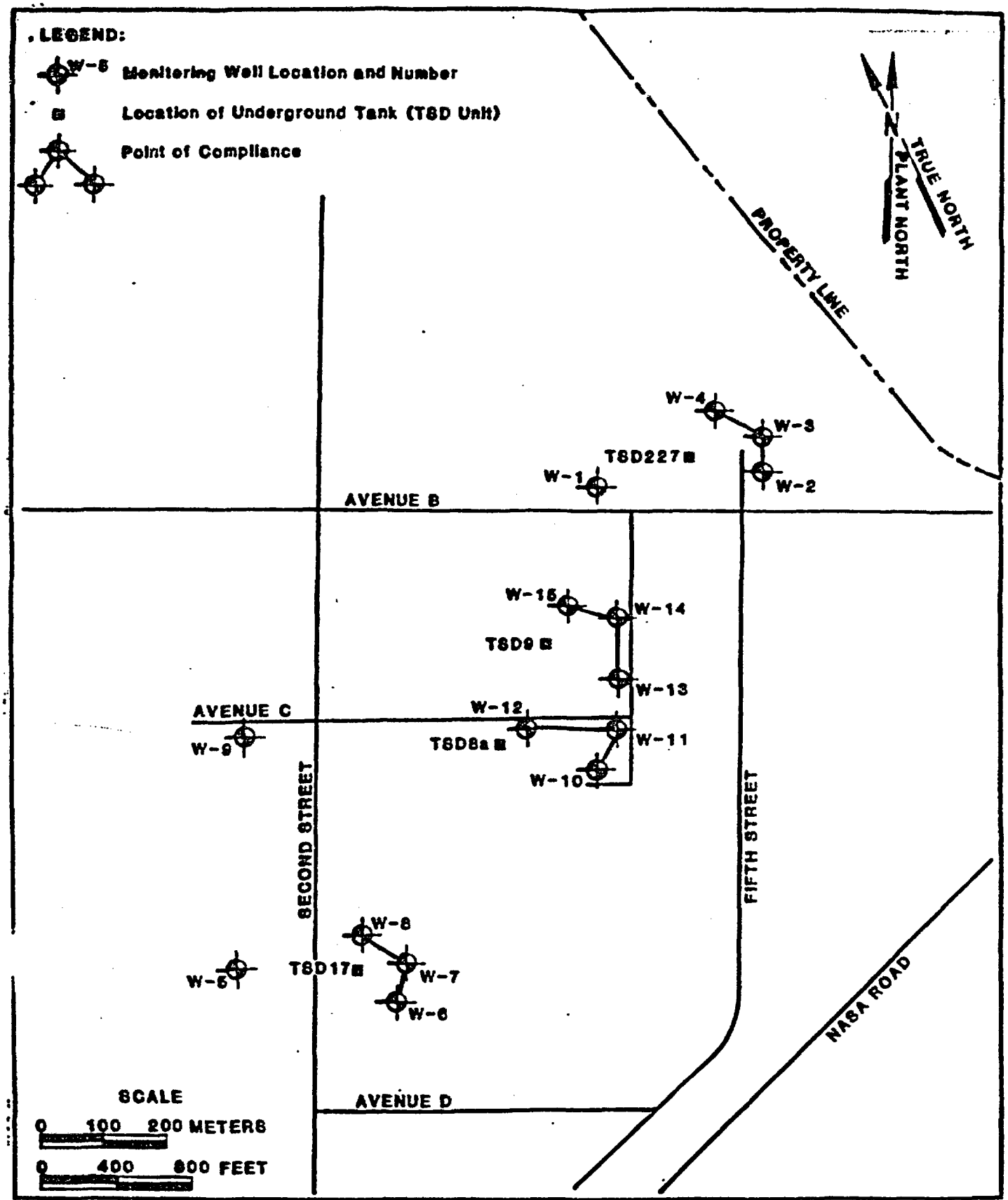
Dowis C. Atkins, Jr.

DCA/WWS/js

Distribution:

SD/Walter R. Hein, M.D.
JJ12/John Herrmann (2)

Files (8)



Harding Lawson Associates
Engineers, Geologists & Geophysicists

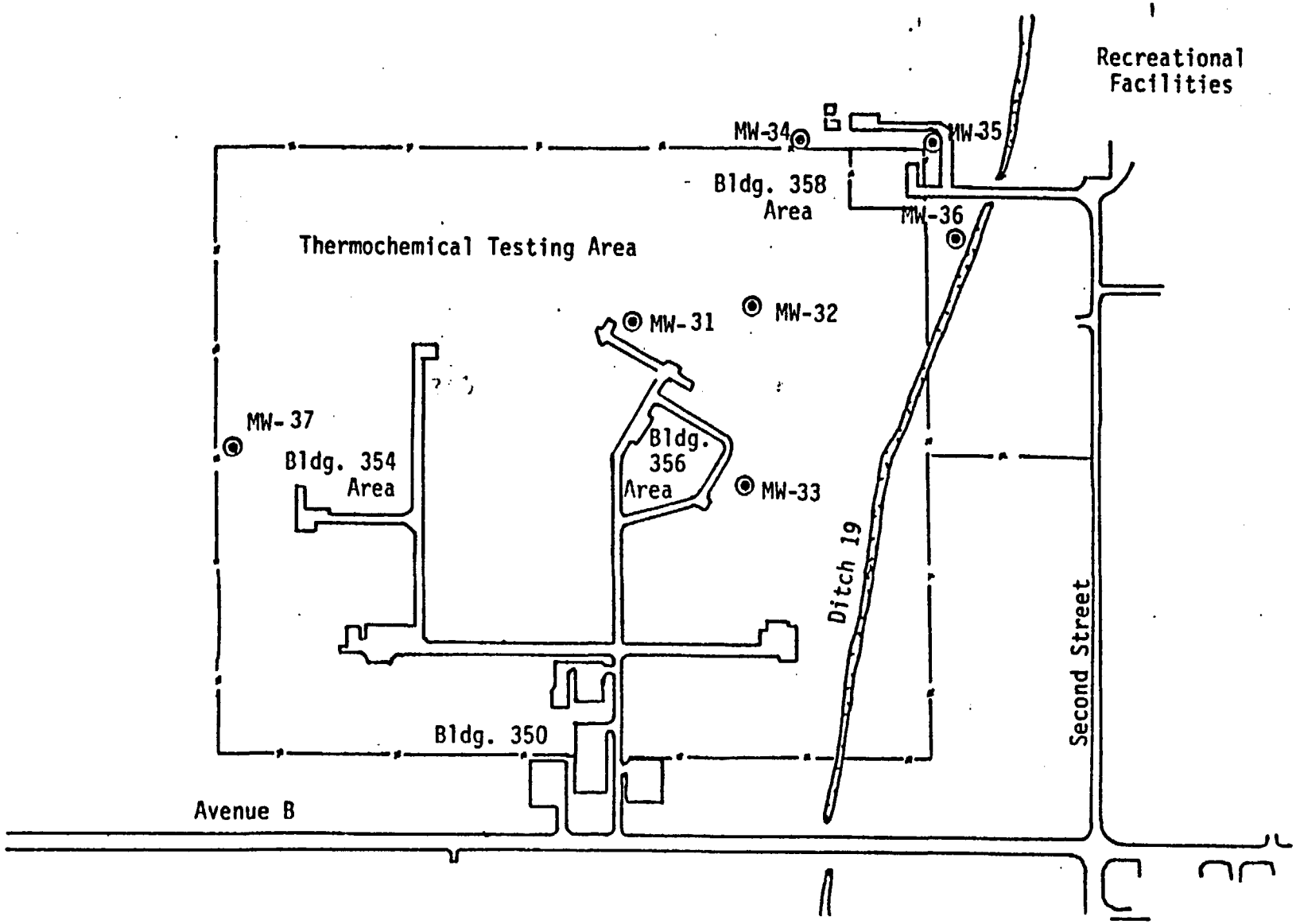
SITE PLAN AND MONITORING WELL LOCATION MAP

NASA/JSC
Houston, Texas

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
JD	17313,010.12		7.31.85		

NFS / NATIONAL SOIL SERVICES
CONSULTING ENGINEERS



PLAN OF BORINGS

PLATE 1

Medical Support Services
NASA-Johnson Space Center
Houston, Texas 77058
713/483-4111

Kelsey-Seybold Clinic, P.A.

SD23(I)
ES-87-57

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: Third Quarterly Report for Groundwater Monitoring Program, July, August, September 1987, NASA/JSC.

In accordance with the JSC Part B Application for a hazardous waste permit, samples were collected from twenty-two (22) wells placed around waste storage tanks at Buildings 227, 9, 8a, 17, Thermochemical Test Area (TTA) and 358 waste storage area. All wells were analyzed for potability, groundwater quality indicators, JSC site specific parameters and toxic organic pollutants. Results are attached.

EPA Priority Pollutants were done on the four (4) upgradient wells by PSI Laboratories. Five (5) turbidity measurements were made by PSI on wells which appeared to be over 5 NTU turbidity. All other analyses were performed by EHL. Specific conductance, pH, temperature and hydrazine were measured in the field with portable instruments. Water depth was measured in each well and the well headspace was tested for aromatic hydrocarbons using MSA detector tubes (none were found) prior to well purging. Each well was purged at least three (3) casing volumes of water (below the miser) before sampling.

Upgradient wells were tested for all priority pollutants and downgradient wells only for volatile priority pollutants during trihalomethane analyses. All wells were tested for pesticides and herbicides. The actual turbidity reading of tested wells are listed with the other wells designated less than 5 NTU by visual inspection.

Two acid extractable phenolics were detected in the low parts per billion range in several wells. These are not believed to be a new occurance but due to lower detection limits of the test over previous analytical results. Gross Alpha counts of three monitoring wells (11, 12 and 15) are over 5 picocuries per liter allowable for drinking water.

SD23(I)
ES-87-57

Subject: Third Quarterly Report for Groundwater Monitoring Program, July, August, September 1987, NASA/JSC.

Delineation and identification of which Alpha emitting agents are present will follow at a later date. The slight trichloroethylene contamination in Monitoring Wells 11 and 12 has diminished to near the reporting limit. Refrigerant 113 (1,1,2-trichloro-1,2,2-trifluoroethane) in Monitoring Well 32 has diminished to less than one part per million; however, it is higher in Monitoring Well 36 (which is downgradient of Monitoring Well 32). All other parameters appear at usual concentrations for all wells.

Dowis C. Atkins, Jr.

DCA/WWS/js

Distribution:

SD22/Walter R. Hein, M.D.
→ JJ12/John Herrmann (2)

Files (5)

Medical Support Services

NASA-Johnson Space Center
Houston, Texas 77058
713/483-4111

Kelsey-Seybold Clinic, P.A.

SD23(I)
ES-88-01

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: Fourth Quarterly Report for Groundwater Monitoring Program, October, November, December 1987, NASA/JSC.

In accordance with the JSC Part B Application for a hazardous waste permit, samples were collected from twenty-two (22) wells placed around waste storage tanks at Buildings 227, 9, 8a, 17, Thermochemical Test Area (TTA) and 358 waste storage area. All wells were analyzed for potability, groundwater quality indicators, JSC site specific parameters and toxic organic pollutants. Results are attached.

Base Neutral EPA Priority Pollutants were done on the four (4) upgradient wells by PSI Laboratories. Turbidity measurements were made for the first time on all wells by EHL. All other analyses were conducted by EHL except specific conductance, pH, temperature, and hydrazine which were measured in the field with portable instruments. Water depth was measured in each well and the well headspace was tested for aromatic hydrocarbons using MSA detector tubes (none were found) prior to well purging. Each well was purged at least three (3) casing volumes of water (below the miser) before sampling.

Upgradient wells were tested for all priority pollutants and downgradient wells only for volatile priority pollutants during trihalomethane analyses. All wells were tested for pesticides and herbicides.

Five Monitoring Wells (6, 13, 15, 31 and 33) significantly exceeded turbidity maximum of 5 NTU for valid sampling. Five wells (4, 6, 34, 35, and 36) contained low levels of the pesticide Endrin. Monitoring Well #32 continued to show significant Refrigerant 113 contamination (EHL

SD23(I)
ES-88-01

Subject: Fourth Quarterly Report for Groundwater Monitoring Program, October, November, December 1987, NASA/JSC.

analysis confirmed by PSI Laboratories) and also slightly exceeded Gross Beta radiation limits for drinking water. All the above anomalies are highlighted in the body-text of the report. All other parameters appear at usual concentrations for all wells.

Dowis C. Atkins, Jr.

DCA/WWS/js

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SD22/Walter R. Hein, M.D.
JJ12/John Herrmann (2)

Files (7)

Medical Support Services
NASA Johnson Space Center
Houston, Texas 77058
713/483-4111

ATTACHMENT E

Kelsey-Seybold Clinic, P.A.
SD23(I)
IH-87-09

FEB 5

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: Ambient Air Quality Status Report for 1986, NASA-JSC.

Attached is subject report for suspended particulate matter at JSC. A total of twelve (12) samples were collected and analyzed. Results show the ambient air quality to be within the Environmental Protection Agency (EPA) primary standard of 260 micrograms per cubic meter of air (ug/m^3) for a 24-hour average. The annual geometric mean is within the EPA standard of 75 ug/m^3.

Dowis C. Atkins, Jr.

DCA/KLB/kt

Distribution:

SD22/Walter R. Hein, M.D.
→JJ/John Herrmann

Files (6)

SD23(I)
IH-87-09

Subject: Ambient Air Quality Status Report for 1986, NASA-JSC.

Ambient Air Quality Status Report
Suspended Particulates Concentration
NASA-JSC

Sample Date	Micrograms Per Cubic Meter of Air (ug/m^3)
16 Jan 1986	23.2
20 Feb 1986	99.4
20 Mar 1986	69.5
22 Spr 1986	30.5
20 May 1986	38.7
25 Jun 1986	45.5
22 Jul 1986	36.5
27 Aug 1986	65.2
17 Sep 1986	34.4
17 Oct 1986	45.5
21 Nov 1986	31.8
31 Dec 1986	9.5

*Sampler located on roof of Building 37.

SD23(I)
IH-87-09

Subject: Ambient Air Quality Status Report for 1986, NASA-JSC.

Ambient Air Quality Status Report
Summary of Results
NASA-JSC

Summary	Concentration of Particulate (ug/m^3)
High	99.4
Low	9.5
Arithmetric Mean	44.1
Annual Geometric Mean (For 1985)	38.2
Annual Geometric Mean (For]986)	33.9
Standard Deviation	23.9

ATTACHMENT F

Moon Gus EH File

PAN AMERICAN WORLD AIRWAYS, INC.

INCIDENT REPORT 80-26

DATE: May 1, 1980 TIME: 1030
LOCATION: Ditch 25, Southside radar range
TYPE OF INCIDENT: Fish Kill
BRIEF DESCRIPTION: Approximately 100 weak fish were found dead or dying, characteristic of insufficient dissolved oxygen conditions.

REPORTED BY: L. B. Copeland PAA
WITNESSES: Ted Stegant, K-S

NASA REPRESENTATIVE ADVISED: Don Moen JJ2 TIME: 1040
M & O CONTRACTOR REPRESENTATIVE ADVISED: B. McCoy TIME: 1030

CIRCUMSTANCE THAT CAUSED INCIDENT: Actual cause unknown until test results are available. Investigation is being made by Ted Stegant for possible run-off of insecticides from Wednesday morning spraying prior to rain.

CORRECTIVE ACTION TAKEN: No clean up action necessary

PROBLEMS ENCOUNTERED: None

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.)

ORIGINATOR: Bobby E. McCoy DATE: 5-1-80

DEPARTMENT HEAD: DATE:

MANAGER, M & O SERVICES: DATE: 2 May 80

FORM PAA-200-8

PAN AMERICAN WORLD AIRWAYS, INC. 81-33

INCIDENT REPORT

DATE: April 24, 1981 TIME: 1330 hours.
LOCATION: B-326 Laydown yard - Kut Rite Area.
TYPE OF INCIDENT: Chemical Spill
BRIEF DESCRIPTION: Concentrated Bromacil spilled during transfer from drum container to applicator.

REPORTED BY: Ray Myers JJ3
WITNESSES:

NASA REPRESENTATIVE ADVISED: D. Moen TIME: 1330

M & O CONTRACTOR REPRESENTATIVE ADVISED: B. McCoy TIME: 1325

CIRCUMSTANCE THAT CAUSED INCIDENT: Thirty five gallons of concentrated Bromacil was spilled from a drum during transfer to the vehicle applicator.

CORRECTIVE ACTION TAKEN: Twenty-two bags of absorbent material (28.6 cubic feet was spread over the entire area, thoroughly mixed, picked up and placed on plastic. A cover was applied for rain protection. Surface restored to normal. The contaminated absorbent will be used along fences.

PROBLEMS ENCOUNTERED: Material very toxic to both animal and plant life. Clean-up had to be performed immediately to prevent soil penetration and run-off from oncoming rains (See attached).

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.) MRSO # 23194

ORIGINATOR: Bobby E. McCoy DATE: 4-24-81

DEPARTMENT HEAD: DATE:

MANAGER, M & O SERVICES: DATE: 27 Apr 81

FORM PAA-200-8 NASA-JSC

PAN AMERICAN WORLD AIRWAYS, INC.

INCIDENT REPORT

81-50 Watson W. Moreland G. Moen File

DATE: June 18, 1981 TIME: 1400 HOURS
LOCATION: Building 358 - Storage yard.
TYPE OF INCIDENT: Chemical Spill
BRIEF DESCRIPTION: High-density solvents spilled all over one laborer, R. Vegas, onto left arm of C. Duhon and onto the asphalt. R. Vegas experienced temporary blurring of vision.
REPORTED BY: C. Duhon
WITNESSES: C. Duhon

NASA REPRESENTATIVE ADVISED: D. Moen, JJ-2 TIME: 1550

M & O CONTRACTOR REPRESENTATIVE ADVISED: B. McCoy TIME: 1410

CIRCUMSTANCE THAT CAUSED INCIDENT: Mechanical rupture of drum head resulted from impact of high-density solvents splashing against highly-rusted metal, during transfer from pallett to cart.

CORRECTIVE ACTION TAKEN: R. Vegas was transported to first aid for treatment of eye irritation. Sorball was spread to absorb liquid solvents. Work order written to reposition safety shower for greater accessibility.

PROBLEMS ENCOUNTERED: Safety shower was difficult to activate.

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.) Photographs.

ORIGINATOR: C. Anderson Cynthia Anderson Bruce 6/19/81 DATE: 6-19-81

DEPARTMENT HEAD: _____ DATE: _____

MANAGER, M & O SERVICES: [signature] DATE: 19 June 81

FORM PAA-200-8 NASA-JSC

John Hermann

PAN AMERICAN WORLD AIRWAYS, INC. 86-12

INCIDENT REPORT

DATE: 2-25-86 TIME: Late morning - detected at 1030 hr
LOCATION: Bldg-223 Sand Filter Basin at water treating plant
TYPE OF INCIDENT: Sludge Spill (Hazardous Waste) Appx 520 Gallon
BRIEF DESCRIPTION: Sludge & water being pumped into the east side of the sand filter basin over-flowed over the west gate and onto the adjacent Pavement and then on a grass covered area north west of the sand beds
REPORTED BY: Paul Riley & Norman Muecke
WITNESSES: Don Amann, Jim Fowler, Joe Golden & Maurice Hautpouier

NASA REPRESENTATIVE ADVISED: John Hermann TIME: 1100

M & O CONTRACTOR REPRESENTATIVE ADVISED: J Fowler TIME: 1045

CIRCUMSTANCE THAT CAUSED INCIDENT: The sludge pump that pumps to the Sand basins was put in operation on the evening of Feb 24th & was inadvertently left in operation over-night. Sometimes during the next morning, the pit ran over & was discovered & corrected at approx. 1030 Feb 25th

CORRECTIVE ACTION TAKEN: (1) Sludge has been cleaned up & contaminated soil is being removed from the site (2) Shift operators has had reemphasis on the importance of shutting off pumps at end of each shift & the relieving operator restart and shut off the pumps if additional pumping is required.

PROBLEMS ENCOUNTERED: The making sure all contaminated soil has been removed from the site

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.)

ORIGINATOR: [signature] DATE: 2-25-86

DEPARTMENT HEAD: [signature] DATE: 2-28-86

MANAGER, M & O SERVICES: [signature] DATE: 2-28-86

FORM PAA-200-8 NASA-JSC

Medical Support Services

NASA-Johnson Space Center
Houston, Texas 77058
713/483-4111

Kelsey-Seybold Clinic, P.A.
SD23(I)
IH-86-22

MAR 1 1 1986

TO: Technical Manager/SD24
Contract NAS 9-17070

THRU: Project Manager/SD22

FROM: Deputy Project Manager/SD23

SUBJECT: Chemical Spill, Cooling Tower Blowdown Pretreatment Facility, Building 223, NASA-JSC.

Environmental Health Services (EHS) responded to a chemical spill from the Cooling Tower Blowdown Pretreatment Facility, Building 223, on 25 February 1986. Approximately 200 gallons of treated liquid from the Building 24 cooling tower blowdown spilled from the drying beds onto a low lying area of soil. The liquid contained high concentrations of zinc and trivalent chromium.

Sand dikes were used to divert and contain the spill. The cleanup operation was conducted by pumping the spilled material back into the drying beds. In addition, a six inch layer of soil was removed from the spill area. Workers participating in the cleanup wore impervious boots and gloves.

The following is a summary of events that transpired after the spill. A sketch of the area with corresponding sample locations is included as Attachment I. Analytical results are included as Attachment II.

Tuesday, February 25, 1986 - A sample of the liquid material was collected and analyzed for zinc, trivalent and hexavalent chromium (Sample 1). A six inch layer of soil was removed from the spill area. Seven (7) soil samples were collected in the area of soil removal and composited for laboratory analysis. (Refer to Attachment I, Samples 2-8).

A composite sample was collected around the perimeter of the spill area (Sample 10) and also from the contaminated soil that had been removed and placed in a plastic-lined dumpster for disposal (Sample 9). A background soil sample was collected from an uncontaminated area (Sample 11).

Thursday, February 27, 1986 - Results of the analysis showed contamination on the perimeter of the spill area. A composite sample was collected on the north, east, and west side of the spill area to more accurately determine the extent of soil contamination. (Refer to Attachment I, Samples 12-14).

Subject: Chemical Spill, Cooling Tower Blowdown Pretreatment Facility, Building 223, NASA-JSC.

Friday, February 28, 1986 - Results of analyses showed contamination to exist on the west side of the spill area. A six inch layer of soil was removed in a 260 square foot area and five (5) individual soil samples were collected along the west perimeter. (Refer to Attachment I, Samples 15-19).

Monday, March 3, 1986 - Results of analyses show one sample (Sample 16) to be contaminated. A six inch layer of soil was then removed in a 640 square foot area.

After soil removal, zinc and chromium levels in cleaned areas do not significantly exceed background levels in the soil at JSC. Therefore, it is concluded that this particular spill has been adequately decontaminated. Beginning in April, monthly soil samples will be collected around the Building 223 Cooling Tower Blowdown Pretreatment Facility and analyzed for total chromium, hexavalent chromium, and zinc.

Dowis C. Atkins, Jr.

DCA/MEW/kt

Distribution:

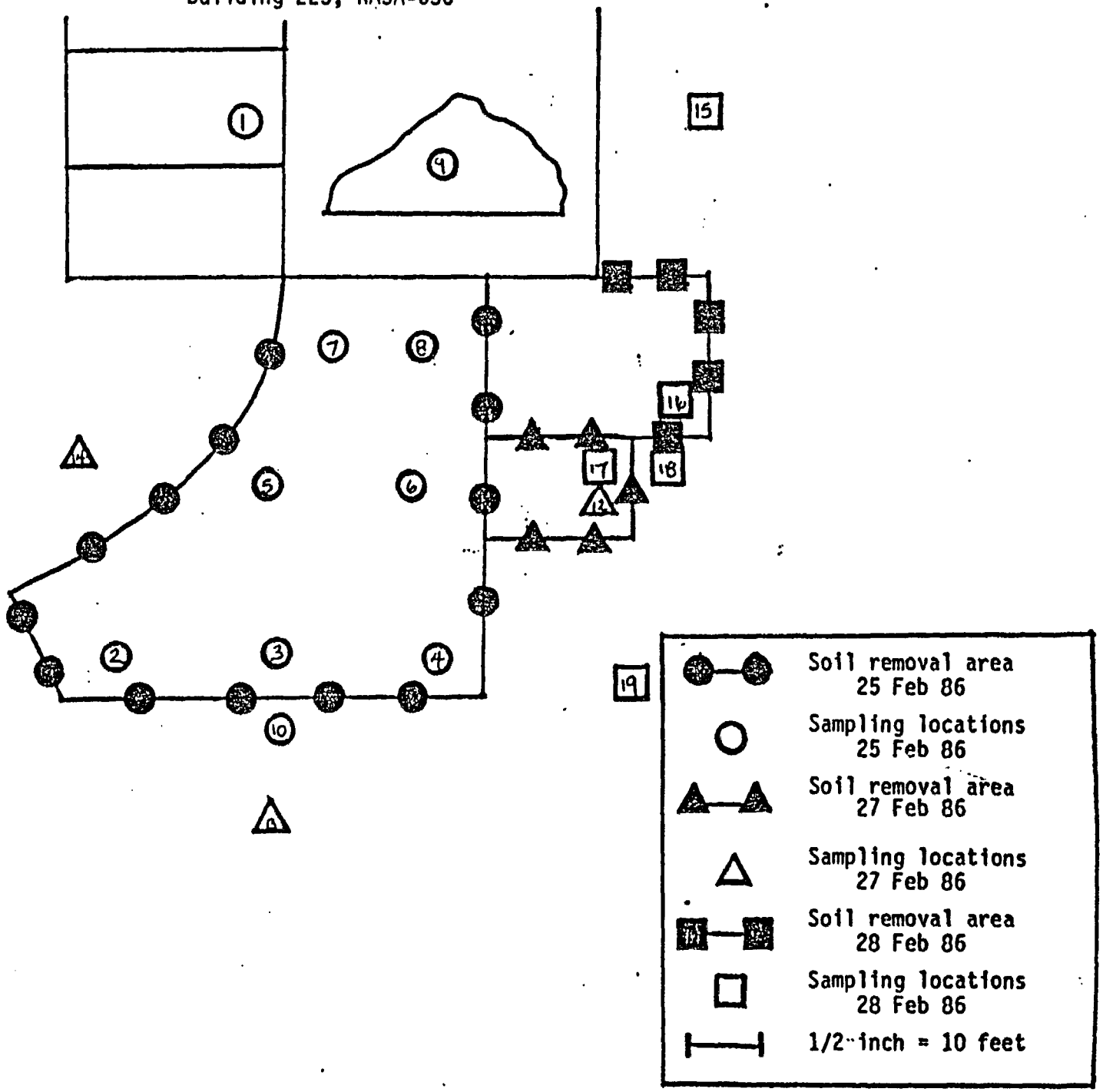
SD22/Walter R. Hein, M.D.
→ JJ/John Herrmann
JJ/Don Moen
Sam Calanni, Pan Am
Jim Fowler, Pan Am
Warren Sproul, EHL

Files (4)

IH-86-22

ATTACHMENT 1

Chemical Spill
Cooling Tower Blowdown Pretreatment Facility
Building 223, NASA-JSC



SD23(I)
IH-86-22

ATTACHMENT II

Analytical Results
Chemical Spill
Cooling Tower Blowdown Pretreatment Facility
Building 223, NASA-JSC

Date	Sample Type	Sample #	Concentration in mg/Kg of Soil (Unless otherwise noted) Hexavalent Chromium	Trivalent Chromium	Zinc
2-25-86	Spilled liquid (grab)	1	<.05 mg/L*	557 mg/L	307 mg/L
2-25-86	Soil (composite)	2-8		17	40
2-25-86	Soil (composite)	9		148	111
2-25-86	Soil (composite)	10		500	490
2-25-86	Soil (background composite)	11		7	15
2-27-86	Soil (composite)	12		410	480
2-27-86	Soil (composite)	13		16	53
2-27-86	Soil (composite)	14		14	55
2-28-86	Soil (grab)	15		24	53
2-28-86	Soil (grab)	16		238	193
2-28-86	Soil (grab)	17		21	41
2-28-86	Soil (grab)	18		32	61
2-28-86	Soil (grab)	19		17	67

*Milligrams per liter.

NOTE: Soil samples were analyzed by the Environmental Health Laboratory (EHL) according to procedures in the EPA Manual "Test Methods for Evaluating Solid Waste", July 1982, by flame atomic absorption spectrophotometry.

PAN AM WORLD SERVICES, INC. HERRMANN MOEN 86-33

INCIDENT REPORT

DATE: JUNE 9, 1986 TIME: 1400 Hrs.

LOCATION: AVE. B WEST OF ELEVATED STORAGE TANK.

TYPE OF INCIDENT: BUILDING 24 COOLING TOWER BLOWDOWN LINE BREAK.

BRIEF DESCRIPTION: RUPTURE IN MAIN CHEMICAL WASTE BLOW DOWN LINE FROM BUILDING 24 COOLING TOWER TO BUILDING 223 WASTE TREATMENT SYSTEM (Approx 300 gallons contained within excavated area.)

REPORTED BY: MR. LUEHKLE

WITNESSES: C/O MAY - W/WW OPERATOR MIKE MORRISON

NASA REPRESENTATIVE ADVISED: MR. DON MOEN/~~MR. J. HERRMANN~~ K. M[illegible] TIME:

M & O CONTRACTOR REPRESENTATIVE ADVISED: JIM FOWLER/MR. GOLDEN/ABADIE TIME:

CIRCUMSTANCE THAT CAUSED INCIDENT: CONTRACTOR EXCAVATING TRENCH FOR NEW CABLE STRUCK AND RUPTURED ABOVE STATED BLOWDOWN LINE.

CORRECTIVE ACTION TAKEN: SECURED ALL MAIN VALVE & SWITCHES ON BLOWDOWN SYSTEM. CONTRACTOR INSTALLED/PLUGGED RUPTURED LINE. REMOVED ALL CONTAMINATED LIQUID FROM RUPTURED AREA BY PUMPING INTO DRUMS. PAA SAFETY DIVISION & ENVIRONMENTAL DIVISION SUPPORTING ACTIVITIES. Samples taken by EHL. reported max conc. of 2.1 ppm Cr. in soil removed

PROBLEMS ENCOUNTERED: MATERIALS IN RUPTURED LINE INDICATED POSITIVE FACTOR OF CHROMATE.

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.) UCS - C/O - Supv.

ORIGINATOR: John D. Pohler DATE: 6/9/86

DEPARTMENT HEAD: L. K. Fuller, Jr. DATE: 6/10/86

MANAGER, M & O SERVICES: J. Golden DATE: 6/11/86

FORM PAA-200-8 NASA-JSC

JJ-86-040

DEC 31 1986

Texas Water Commission
Attn: Mr. Merton J. Coloton
Chief, Enforcement Section
Hazardous and Solid Waste Division
P. O. Box 13087, Capitol Station
Austin, TX 78711

Dear Mr. Coloton,

In accordance with Section 335.137 of the Texas Administrative Code, the Johnson Space Center (JSC) is submitting a written report within fifteen (15) days of the activation of our Environmental Emergency and Contingency Plan.

1. Name, address, and telephone number of owner/operator:

NASA Johnson Space Center (TX71022)
2101 NASA Road 1
Houston, TX 77058
713-483-3120

2. Name, address, and telephone number of facility:

Same as above.

3. Date, time, and type of incident:

On Tuesday evening, December 16, 1986, at about 7:30 p.m., the on-duty operators of the Wastewater Treatment Facility identified a leakage of concentrated sulfuric acid from the suction-side fittings on one of the chemical pumps in the pump-room at building 223 located on the premises of JSC.

4. Nature and quantity of material involved:

Approximately 500 gallons of sulfuric acid were spilled, based both on visual observation and subsequent inventory reconciliation. Sulfuric acid is extremely corrosive, reacts violently with water, and is acutely toxic to fish and wildlife in very low concentrations.

5. Extent of injuries:

None

	CODE →		JJ/JPH	JJ/IKM	JA/GEM				
CONCUR	INITIALS →								
	DATE →		12/30/86	12/31/86					

6. Assessment of actual or potential hazards:

All of the spilled material was completely contained on the premises of JSC, with no threat to waters of the State. The acid entered a drainage ditch, which was successfully blocked off before material could migrate beyond the facility boundary. The pH of drainage ditches leading offsite were monitored continually to verify containment.

7. Estimated quantity and disposition of material:

The initial response, following containment of the drainage ditches involved, was to utilize copious amounts of water to mitigate imminent endangerment to response personnel. Water was used to flush the acid into a containment area, and this water was evacuated by a vacuum truck. Approximately 30,000 gallons of this low pH water were taken to a secured wet well for pH adjustment and subsequent discharge to the Clear Lake City Water Authority Wastewater Treatment Plant. In addition, about 20,000 gallons of contaminated rainfall were intercepted and pumped to the wet well for pH adjustment prior to discharge to the sanitary sewer system. The remaining soils were initially neutralized with a weak base, namely lime, and subsequently neutralized with sodium hydroxide in order to get the material into a more workable state, i.e., in the range of a pH of 1.5 - 2.5. Contaminated soils were then excavated from the drainage ditch to approximately a level of 18 inches, in order to attain a pH reading of not less than 5. Approximately 72 cubic yards of contaminated soils were shipped as hazardous waste to the Chemical Waste Management Landfill in Carlyss, Louisiana.

The spill was apparently caused by a failed fitting on the suction side of one of the chemical pumps. The situation was exacerbated by the operators' failure to follow prescribed standard operating procedures for routine inspection of the plant. In order to avoid recurrence of this incident, the following steps have been undertaken:

1. Standard procedures are being re-evaluated, and formalized inspection logs will be incorporated into the procedure, in order to ensure better documentation of facility inspections.

2. Better controls will be implemented to ensure the procurement and use of proper materials for maintenance of sensitive/critical equipment.

3. A facility modification will be made to provide secondary containment within the pump room.

4. A design study has been initiated to review the overall chemical storage and delivery system for the Wastewater Treatment Plant.

If you have any further questions, please contact Mr. John Herrmann, Chief, Environmental Services Office, at 713-483-3120.

Sincerely,
Original Signed By
G. E. McCRIGHT

K. B. Gilbreath
Director, Center Operations

cc:
Ms. Sandy Parker
Texas Water Commission
4301 Center St.
Deer Park, TX 77536-6299

bcc:
AC/C. L. Huntoon
Pan Am/J. F. Golden

JJ12/JPHerrmann:pjg:12-30-86:33120

...tion Services
NASA-Johnson Space Center
Houston, Texas 77058
713/483-4111

Kelsey-Seybold Clinic, P.A.
SD23(T)
ES-87-02

To: Technical Manager/SD24
Contract NAS 9-17070

Thru: Project Manager/ SD22

From: Deputy Project Manager/SD23

Subject: Sulfuric Acid Spill, Building 223 Cooling Tower Blowdown Pretreatment Facility, December 16, 1986, NASA/JSC.

On the evening of December 16, 1986 sometime before 1930 hours the number two (#2) acid pump at the Building 223 chrome treatment facility began pumping approximately 97% concentrated sulfuric acid out onto the floor of the pumphouse. Estimate of the amount of acid spilled was 500 gallons. The acid flowed out the west pumphouse door and wall area into a gravel drainage area (see map area #1). From this point it flowed into an earthen ditch to a point approximately 15 yards south of Avenue B where it was contained by an earthen dam (see map area #2 thru #7).

Tests conducted on the standing liquid on the morning of December 17, 1986, after initial containment efforts of the night before, showed pH readings ranging from 1.1 to 2.5 along the entire spill area. Numerous readings were made using a pH probe (meter). The standing liquid was pumped into a tanker at a point approximately 35 yards downstream from the driveway culvert and transferred to the treatment wet well for neutralization and sanitary sewer disposal.

Soil borings were made at the bottom and sides of the ditch to determine the depth and width of the acid penetration. Measurements were made with wide range pH paper (1-12). These borings showed that the acid had penetrated the bottom of the ditch from 8 to 12 inches in depth; however, it had not soaked into any of the banks of the ditches. Adjacent connecting ditches were also analyzed for acid contamination and found to be uncontaminated. At least 5 drums of liquid caustic and an unknown amount of caustic from the large containment area tank were used to help neutralize the acid spill. Contaminated soil was excavated in area #7 (see map) by backhoe and hand shoveling at the farthest extent of the spill and tested above pH 5 at 1700 hours on December 17 (pH 5 was used because surrounding uneffected rainwater puddles containing decaying leaves had a pH of 4.5 to 5.5). Gravel and soil from Section #1 was removed on the evening of December 17 using hand shovels.

Subject: Sulfuric Acid Spill, Building 223 Cooling Tower Blowdown Pretreatment Facility, December 16, 1986, NASA/JSC.

Section #4 is a closed concrete pipe which the acid flowed through to contaminate another nearby earthen ditch. Area #5a was contaminated for approximately 3 yards and 5b less than 1 yard. Sections #2, 3, 4, 5a, and 5b were decontaminated by December 18, with the use of hand shovels and water from a high pressure hose. Sections 2, 3, 4, 5a, and 5b held only a narrow, approximately one (1) foot wide, zone of acid penetration into the soil. Section 6 contained an approximately 2 1/2 foot wide area of contamination which was excavated and removed by backhoe on December 19 and 20. Waste soil and gravel was placed in water tight metal dumpsters for hazardous waste disposal with the exception of some high water content soil which was put in a covered chrome sludge drying bed for drying and eventual disposal.

Over fifty (50) borings and tests were made after clean-up along the entire effected area and adjacent areas. Because of standing rainwater in the newly dug trench this could not be completed until January 2, 1987 when the entire site was determined to be contamination-free.

Dowis C. Atkins, Jr.

DCA/WWS/js

Distribution:

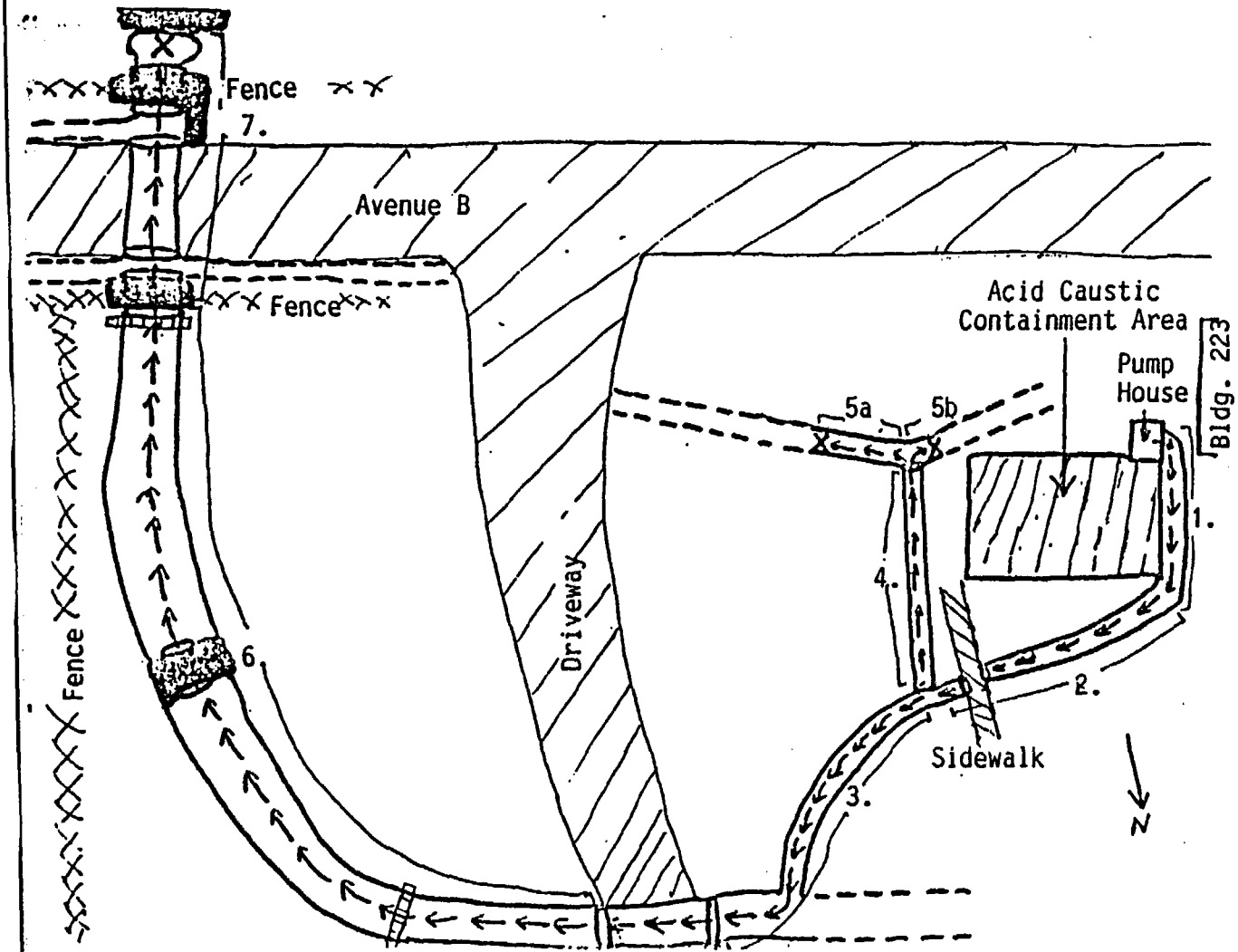
SD22/Walter R. Hein, M.D.
JJ/John Herrrmann
JJ/Don Moen
Pan Am/Jim Fowler

Files(7)

SD23(I)
ES-87-02

SULFURIC ACID SPILL
OF DECEMBER 16, 1986
BUILDING 223 COOLING TOWER BLOWDOWN PRETREATMENT FACILITY
NASA/JSC

ATTACHMENT I



MAP KEY

- Acid Spill Ditch Area
- Uncontaminated Ditch Area
- Paved Area
- Earthen Dam
- Sandbag Levee
- Fence
- Concrete Culvert
- X — Farthest Extent of Acid Spill
- 1 — First Area of Spill Covered with 2" Gravel (15 yards)
- 2 — Narrow 1' Width Ditch with Steep Slope (15 yards)
- 3 — Narrow 1' Width Ditch with Steep Slope (18 yards)
- 4 — 12" Concrete Culvert Allowing Backflow to S Ditch (16 yards)
- 5a & 5b — Limited Contamination in Upper Ditch (4 yards)
- 6 — Long 2 1/2' Wide and Shallow Ditch (120 yards)
- 7 — South Avenue Culverts and Dams Marking Farthest Extent of Spill (35 yards)

* All distances are stepped off and not measured precisely.

Drawn by WWS
Not To Scale

CONTRACTOR:	CONTRACT NO.
PAN AM WORLD SERVICES, INC.	NAS 9-17750

Engineering Division
Lyndon B. Johnson Space Center
Houston, Texas

DOCUMENT COVER SHEET

REPORT OF ACID SPILL AT BLDG. 223

ON DECEMBER 16, 1986

WR#	MCP#	DATE
COF#		

PREPARED BY:	J.D. Fowler, Environmental Manager 2-11-87
APPROVED:	J.F. Golden, Project Director
APPROVED:	J.P. Herrmann, Chief Environmental Servs.,
APPROVED:	K.I. McQuary, Technical Manager K Keith McQuary

NO. OF PAGES_____

REVISIONS

DATE	PREPARED BY	APPROVALS	REVISION LETTER

REPORT OF ACID SPILL AT BUILDING 223 ON DECEMBER 16, 1986

I. INTRODUCTION

The purpose of this report is to summarize the sequence of events leading up to the acid spill at Building 223 on December 16, 1986, document the containment and neutralization operation, establish the probable cause of the leak, summarize conclusions, and provide action to date. The report was compiled from the assessment reports submitted by Pan Am PMOH Managers and Supervisors, and from the estimated volumetric loss summarized by the NASA/Chief, Environmental Services.

II. SEQUENCE OF EVENTS

On December 16, 1986, the Building 24 cooling tower conductivity readings were 2100 on the South meter and 2200 on the North meter. These readings were sufficient to cause Pan Am operations personnel to prepare Building 223 (Chromate Reduction Facility) to receive blowdown from the Building 24 cooling towers.

This activity often requires the fluid in the flocculator and outfall flume to be recirculated until a pH of 7.5 to 9.5 is reached. This was the case on December 16. Recirculation began at 1130 hours and was secured at 1400 hours. During this time frame, it was necessary for the Water/Wastewater Operator to operate the chemical pumps in the pump house in the RECIRCULATE mode.

During the recirculation process, there was no detection of a chemical leak. The Building 223 pump house was locked at about 1400 hours with the pumps placed in the following configuration.

Chemical/ Pump No.	Suction Side	Discharge Side	Power	Mode
Caustic Pump #1	OPEN	OPEN	ON	AUTO
Caustic Pump #2	CLOSED	CLOSED	OFF	AUTO
Acid Pump #3	OPEN	OPEN	ON	AUTO
Acid Pump #4	CLOSED	CLOSED	OFF	AUTO
Sulfite Pump #5	OPEN	OPEN	ON	AUTO
Sulfite Pump #6	CLOSED	CLOSED	OFF	AUTO

At 1540 hours the second shift Water/Wastewater Operator (Kenneth Lunday) conducted an inspection of the blowdown facility. Procedures, at that time, required operator to verify plant configuration was ready for blowdown. Mr. Lunday did not enter the locked pump house.

The next site inspection was conducted at 1930 hours (four hours later) by the Chief Roving Operator, Bill Pillers, and Water/Wastewater Operator, Kenneth Lunday. It was at this time that the acid leak inside the pump house was detected. Mr. Pillers, seeing the leak from the suction side of Acid Pump #3, closed the pump #3 supply valve and opened all circuit breakers. He also noted the broken lines from the suction and discharge side of pump #4 but saw no indication of leaks from those lines.

Not w/ the condition of the lines @ the 1400 entry no record in log.

After securing the suction valve for pump #3 and securing the circuit breakers, Mr. Pillers notified the Shift Supervisor, Lester Fuller, about 2000 hours and also notified the second shift Mechanical Supervisor, Donnie Gray. Mr. Fuller immediately went to B-223, directed samples be taken at various locations to determine the extent of contamination, and coordinated placement of sandbags to block the drainage ditch near Avenue B. About 30 minutes later (2030 hours), notifications were made to Jim Fowler, John Herrmann, and Don Moen. These three individuals arrived on the scene shortly after 2100 hours and took charge. Webb Murray and Kelsey-Seybold were notified at 2150 hours at John Herrmann's request.

III. CONTAINMENT AND NEUTRALIZATION

A survey of the situation was completed by approximately 2130 hours. The survey confirmed a sulfuric acid leak had occurred inside the B-223 pump house. The acid had drained through the west side of the building into four inches of crushed rock and into the soil below. The acid continued to flow northward to the edge of the building into a drainage ditch which runs in a north easterly direction for about 50 yards, turns easterly for another 50 yards and under a culvert, and then runs south for about 100 yards. The material flowed through four culverts and stopped south of Avenue B past a small culvert.

Upon inspection of the drainage ditch at about 9:30 pm sand bag containments were found at the bend where the ditch turned south and immediately south of Avenue B.

The acid was found all along the drainage ditch in small poolings.

The main concern at this time was to insure that the acid did not travel any further down stream, and that containment was properly established. The containment at the bend was considered in a low area and a new sand bag dam was constructed up stream about 15 yards. At this time Bealine was requested to provide a tanker that could handle sulfuric acid. They furnished a 5,000 gallon stainless steel tanker. A fire hose was used to flush and dilute the acid content in the drainage ditch. The acid and water was pumped from the ditch into the tanker and discharged into the B-223 wet well. Approximately 100,000 gallons of water and acid was transferred to Wet Well #1, and held until neutralized to a pH between 6.5 and 9.5.

After the ditch was flushed (minimum of three times) and all the water transferred to the wet well an effort was made to neutralize the ditch with lime. Soil samples and pH readings indicated a pH of 0 to 1 still existed. To neutralize the soil approximately 200 gallons of 50% Sodium Hydroxide was poured into

the ditch as a means for neutralizing the acid that had leached into the ground. Unfortunately, the effect was minimal. There was a lot of surface reaction but very little soil penetration.

After flushing the culvert with copious amounts of water a very low pH still existed. The silt that was in the bottom of the culverts had absorbed much of the acid and the silt was not being flushed out from the culvert. . To remove the silt from the culverts it was necessary to pull the fire hose through using a rope and having the nozzle in a spray configuration. This provided a short distance between the nozzle and the silt thus forcing the silt to break up and be flushed out of the culvert. Once this was accomplished the pH ~~dropped~~ increased immediately to a neutral level.

The next phase of the clean up was to remove all of the soil that was contaminated. All the rock was removed on the west side of the pump house and approximately a foot to eighteen inches of soil was removed from the entire length of the drainage ditch. This was accomplished by using a backhoe and a front end loader. The dryer contaminated material was placed in roll offs and the wetter material was placed on the B-223 sand beds to allow the water to drain. The material placed on the sand beds were later placed in roll-offs. Ten roll offs of contaminated soil were transported to Carlyss, LA for disposal.

how much yd3 or tons?

After all the contaminated soil was removed, 3:00 a.m. Sunday morning, December 21, pH tests were taken of the ditch bottom and sides. Most of the pH readings were in a range of 6 to 7. The bottom and sides of the ditch were then limed with 500 pounds of lime and was allowed to sit undisturbed until the next afternoon. All subsequent pH readings along the ditch read in the basic range of 11 to 12.5.

The ditch was checked twice during the next two weeks and soil pH taken. All readings continued to be in the basic range even after a few rain showers which should have promoted leaching of any acid left in the soil.

IV. CAUSE OF ACID LEAK

Operations generated an SRT 23881 to repair an acid leak at Pump #3 in Building 223. A work request (80906) was submitted December 8, 1986, and the repair was completed on December 11. An investigation revealed that the leak was from a connector that coupled a 3/4-inch PVC pipe to a 3/8-inch Teflon tubing. A pipe fitter had erroneously installed a nylon connector instead of a TFE (teflon) connector. The connector had dissolved to the point where an approximate four-foot head tank pressure caused separation of the 3/8-inch tubing from the 3/4-inch supply line and allowed acid to drain from the 3/4-inch line.

The cause and role of the broken connectors on pump #4 is not clear. To help determine the possible cause of the broken lines from Pump #4, an independent analysis was conducted by Southwestern Laboratories, to determine if the failure was caused from pressure or external stress. The report, attachment 1, indicated the connector material analyzed was made of acrylonitrile/butadiene/styrene (ABS) rather than Kynor. The material was very brittle with no indications of pressure or stress condition. Therefore the actual cause of line separation is still unknown.

V. ESTIMATED AMOUNT OF ACID LOSS

The amount of acid lost is estimated to be between 369 and 479 gallons. This conclusion is based on the following. Records indicate that approximately two feet of acid was seen in the acid tank site glass on September 19. According to a chart maintained in the B-223 laboratory, a two-foot reading indicates 817 gallons were in the tank. After the incident, a measurement was taken which indicated there were about two inches of acid left in the tank, which represents 68 gallons. The log sheets indicate there were 12 blowdowns between September 19 and December 16. These logs also indicate there were 344.25 hours of blowdown during September 19 through December 16. Since no data was logged as to pump settings during approximately half of the blowdown periods two assumptions need to be considered to estimate the pump rate.

(a) Assume that the last logged pump setting is the same as during a blowdown. If this were correct, approximately 270 gallons of acid was dispensed.

817 gallons - (68 gals. + 270 gals.) = approximately 479 gallons.

This represents a pump setting of about 50 ml/minute which is low when compared to the average of the data actually available which indicates an average setting of 71 ml/minute, (2) if the 71 ml/minute value is used then 380 gallons of acid would have been dispensed during the time period of interest.

817 gallons - (68 gals. + 380 gals.) = approximately 369 gallons.

Using another approach, a first approximation calculation using the equation established by John Herrmann (Attachment 2), indicates that in 5.5 hours approximately 330 gallons of acid could have drained from the 3/4-inch supply line.

These values are considered to be reasonable boundaries on the amount of acid lost, and in terms of the neutralization effort, the amount of soil removed, and how far the acid had travelled.

VI. COST OF CLEAN-UP ACTIVITIES

Total estimated cost for containment, soil removal, clean up, acid loss and disposal is estimated to be $42,000. This is broken down in the following manner.

1. Containment/Soil Removal

Craft	M/Hrs	Labor Cost	Mat'l Cost	Total
EV	77			
MX	394			
MW	56			
MN	2			
MA	10			
MB	3			
MG	9			
	551	$12,963	$ 1,326	$14,289

2. Clean Up

MW	90			
MX	190			
EV	10			
	290	6,815	700	7,515

Neutralization?

3. Disposal Cost

Beeline Tanker (45 hrs.)		2,475	
10 roll offs		8,000	
CWM landfill		9,660	
	-0-	20,135	20,135

4. Cost of Estimated Acid Loss -0- 216 216

Total Project Cost 19,778 22,377 42,155

VII. CONCLUSIONS

Insufficient maintenance quality assurance was a contributing factor. Even though the nylon connectors had previously been determined as being incompatible with concentrated sulfuric acid they had not been purged from the tool kits and bench stock as they were acceptable for use on the caustic and sulfite systems. Adquate procedures to insure proper use of the nylon/teflon connectors had not been developed.

A new contingency plan had been in place but had not been thoroughly reviewed by personnel and therefore proper reporting procedures were not followed.

Accepted operator procedures were not totally followed. The pump house should have been inspected when the shift changed.

Log data content and accuracy of data measurements need to be improved.

VII. CORRECTIVE ACTIONS TO DATE

All nylon connectors associated with the B-223 chemical pumping system have been removed from bins and tool boxes. Only TFE connectors will be used on the acid, caustic, and sulfite systems.

A memorandum was written reinforcing the requirement to make the proper notifications of a chemical spill before performing any containment, or investigations. (Attachment 3).

Instructions have been given to the operators to maintain a narrative log book at Building 223 which includes a preblowdown checklist. (Attachment 4).

A list of B-223 improvement recommendations has been compiled and provided to JJ (Attachment #5).

ATTACHMENT 1

FUTURE ANALYSIS OF TWO PIPE FITTING SAMPLES

SwL SOUTHWESTERN LABORATORIES

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

222 Cavalcade St. • P.O. Box 8768, Houston, Texas 77249 • 713/692-8151

Report No. 87010
File No. 2-6898-00
Date: 01/21/87

Pan Am World Services, Inc.
Post Office Box 58938
Houston, Texas 77258-8938
Attention: Mr. Don Jeffers

Project: Failure Analysis of Two Pipe Fitting Samples
Ref: Purchase Order Number 86-4830

-

INTRODUCTION

One (1) - section of a pump with pieces of two fractured nipples (parts of which were left inside the head) were received at Southwestern Laboratories on January 05, 1987.

The plastic components which were reportedly made of Kynar (a product of Pennwalt Corporation) had failed in service. The pump had been used in 66 Baume sulfuric acid service for a two week period when failure occurred. Service conditions were reported to be 65°F temperature and ambient pressure, however failure had not occurred while the unit was in operation. No other operating conditions prior to or at the time of failure were reported.

SCOPE OF WORK

Southwestern Laboratories was requested to conduct an investigation in order to determine the following:

1. Nature and cause of the failure.
2. Did the failure of the fittings occur by external forces or internal pressure.

RESULTS OF INVESTIGATION

1. Infrared Analysis

A Fourier Transform Infrared analysis (FTIR) was conducted on the black and white portions of the failed fitting sample. FTIR analysis of the black resin was consistent with acrylonitrile/butadiene/styrene (ABS) copolymer. There was no evidence of Kynar detected in this sample. The white resin portion of the fitting sample indicated that this

material was also ABS. No evidence of Kynar was observed in this sample either. It is evident from the above evaluation that the failed fittings were not made of Kynar, as reported, rather were analyzed to be ABS, a copolymer of styrene.

2. Visual Examination

A visual examination of the fitting after cleaning in distilled water revealed that several failed pieces of the nipples were missing. Of those that were available, all sections revealed multiple cracks/blisters at the inner diameter surfaces. Fracture had occurred in a brittle manner along the longitudinal and transverse directions, there being no evidence of overloading or overpressuring from the outer or inner diameter surfaces of the nipple.

3. Scanning Electron Microscopy

The fractured specimens were examined in greater detail with the scanning electron microscope. Figure No. 1 shows a section of a large blister at the center with other smaller blisters and cracks on the entire fracture surface. The fracture mode was primarily brittle, which indicated that there was no stretching or overloading prior to or at the time of failure. Blistering of this type indicates that the material had experienced corrosion/degradation from the environment that was present inside. All fractures were observed to have initiated from the inner diameter surface. Figure No. 2 shows a higher magnification view of the brittle fracture face, showing no evidence of the material having stretched prior to the fracture. The center of the micrograph shows a blister.

The inner diameter surface of the nipples were full of cracks and blisters. Some of these cracks/blisters have been shown in Figure No. 3. The presence of blisters at the inner diameter surface of the nipple indicated that the corrosion reaction had resulted in the creation of internal forces within the material which, in turn, were responsible for the rupture.

DISCUSSION

Failure of the submitted material occurred due to the corrosion/degradation of the same when used with sulfuric acid.

The fitting was observed to be made of ABS instead of Kynar, as reported. The former material has very little resistance to sulfuric acid unlike Kynar, which can be safely used with this specific acid. It is therefore quite evident that the material would corrode in a short time after being placed in a corrosive environment.

There was no evidence of any external or internal overpressure conditions being responsible for the failure of the fittings.

CONCLUSIONS

1. Failure of the fittings occurred due to corrosion/degradation of the material by sulfuric acid. The failure mechanism suggested that no external or internal mechanical stresses had contributed to the rupture. Corrosion reactions within the material had caused the blistering which created sufficient internal stresses to cause the fracture and displacement of the failed pieces.

2. The fittings were analyzed to be made of ABS, rather than Kynar as reported. ABS is not considered to be resistant to sulfuric acid.

Note: The submitted material will be discarded after a period of thirty (30) days unless otherwise directed.

Sincerely,

SOUTHWESTERN LABORATORIES, INC.

Adil H. Khan

Adil H. Khan, P.E.
Metallurgical Engineering Division

Reviewed By

STATE OF TEXAS
ADIL H. KHAN
58258
REGISTERED
PROFESSIONAL ENGINEER

AHK:ckl

ATTACHMENT 2

FIRST ORDER CALCULATIONS

John Herrmann/Jim Fowler

ATTACHMENT 2

ESTIMATION OF VOLUMETRIC FLOW
LOST IN TANK INCIDENT @ B-223

J.D. Fowler's comments on John Herrmann's assumption*

Assume Hagan - Poiseville Law

Inherent Assumptions

- Frictionless Fluid

  [Poor assumption, due to nature of H_2SO_4, but should provide a rough estimate, on conservative side for rate of material flow]

- Laminar Flow

  [For small diameter tube, low, flow, not too bad an assumption but will check validity]

- Incompressible Fluid [good assumption]

1) $Q = \frac{\pi \Delta P}{8 \mu L} a^4$ where ΔP = pressure drop

a = radius at tube (I.D.)

μ = viscosity

L = length at tubing

For 3/4" line (O.D.)

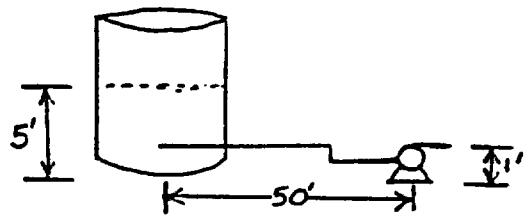
a = 0.3 6 * (INSIDE RADIUS)

= 0.0265 ft.

2) $\Delta P = P_1 - P_2$

$P_1 = h_1 \rho \frac{g}{g_c}$

Assume 5 ft. head (h_1)



[This calculation should provide a worst case scenario, since 5 ft. head represents the initial flow condition. As material is released, head will f ll thereby decreasing flow rate.]

Assume 1 ft. head elevation in tank at discovery and securing of leaking line. (h_2)

$\Delta P = \rho (h_1 - h_2) \frac{g}{g_c}^2$

From Perry's handbook for H_2SO_4 @ 60°F

$$\rho = 114 \text{ lb/ft}^3$$

$$\Delta P = 4(114) = 456 \text{ lb}_f/\text{ft}^2$$

or 3 psi

(Reasonable figure)

From Perry's handbook

$$\mu = 55 \text{ cp} \text{ @ } T = 60°F$$

Assume equivalent flow length at 50 ft. from tank to point of discharge.

Substituting into 1)

$$Q = \frac{\pi[456 \text{ lb}_f/\text{ft}^2][.0265 \text{ ft}^4]}{8[55 \text{ cp}]\left[\frac{1 \text{ lb/ft-sec}}{1488 \text{ cp}}\right]\left[\frac{1}{32} \frac{\text{lb}_f}{\text{lb}} \frac{\text{ft}}{\text{sec}^2}\right][50]}$$

$$= 0.00251 \text{ ft}^3/\text{sec.}$$

$$= 0.0188 \text{ gls/sec.}$$

$$= 1.127 \text{ gpm.}$$

0.686 gpm

Checking for laminar flow assumption

$$v = Q/A = \frac{.00251 \text{ ft}^3/\text{sec}}{\pi(.72^2)/4} = 0.0062 \text{ ft/sec}$$

Reynold's number

$$Re = \frac{Dv\rho}{\mu}$$

$$= \frac{\left(\frac{0.72}{12}\right)\left(.0062 \frac{\text{ft}}{\text{sec}}\right)\left(114 \text{ lb/ft}^3\right)}{\frac{55}{1488} \text{ lb/ft-sec}} = 1.147$$

$$= 1.147 < 2000$$

flow is laminar

Based on foregoing, the maximum flow of material, which would have occurred at the beginning of leakage is 1.13 gpm.

Based on records at the plant, there were 369 to 479 gals of acid unaccounted for since September's last gauge reading.

Hence 373* gallons could have been lost in 5½ hours* assuming a 3/4 inch diameter source line at a maximum flow rate. Indications are that two pumps may have contributed to the flow of acid if the flow time was much shorter than 5½ hours or there was less chemical loss than estimated.

ATTACHMENT 3

TELEPHONE NOTIFICATION AND RELATED PROCEDURES FOR CHEMICAL/HAZARDOUS WASTE SPILL INCIDENTS

MEMORANDUM

TO:	DIVISION	LOCATION	DATE:
CHIEF SHIFT SUPERVISOR	AD	PMOH	21 January 1987
			FROM: MANAGER UTILITIES OPERATIONS
			REFERENCE:

SUBJECT:

Telephone Notification and Related Procedures for Chemical/Hazardous Waste Spill Incidents

Please direct all Shift Supervisors to comply with the following telephone notification and related procedures in the event of a chemical/hazardous waste spill incident.

In the event of a chemical/hazardous waste spill incident, the UCS Operator/Dispatcher should be directed to make the phone contacts listed below. These contacts should be made as soon as possible after confirmation of a serious spill incident.

1. JSC Fire Department EXT. 33333

2. Pan Am Duty Officer

3. Jim Fowler - Pan Am Environmental Group Manager

   Home (b) (6)
   Office 55207

The following calls should be made next as a backup for the Fire Department dispatcher notifications.

1. John Herrmann NASA/JJ12

   Home (b) (6)
   Office 33120

2. Don Moen NASA/JJ12

   Home (b) (6)
   Office 33119

at 13.

All of the above notifications will be made in the event of a hazardous/toxic chemical spill. Give the people being contacted as much information as possible about the incident, but do not delay making contacts in order to investigate an incident any more than necessary to determine if a hazardous/toxic spill in fact has occured.

The following guidelines should be used to determine if an incident is serious enough to report.

The following quotation is from Plant Engineering Division Management Issuance, Reference 3. "If less than 55 gallons of a hazardous material or hazardous waste is released within a containment area, notification will not be required, unless the material is considered to be acutely toxic." If the spill is suspected to be toxic, always consider the situation to be a serious chemical spill.

Every chemical spill is to be logged in the OCC Shift Supervisor's log. The details of the incident are to be included (what, where, when, how) in the log entry. The Pan Am Duty Officer and Jim Fowler are to be notified about all spills. However, small spills that have been well contained and represent no further threat of contamination can be reported as time permits during regular work hours. If there is any doubt about the seriousness of a chemical spill, the Shift Supervisor should make all the phone contacts specified above as quickly as possible.

Safety must be the most important consideration for all spill incidents. Operators or other personnel should not expose themselves to liquid, vapor or other potentially harmful contact with chemicals. Do not permit containment, sampling, testing or other remedial actions if there is any risk of chemical injury to personnel. When the size of a spill and the location of a spill safely permit use of readily available containment equipment and barriers, the spill should be contained as much as possible. Otherwise, personnel at the scene are to wait until the designated NASA, Pan Am or other support arrives to direct implementation of the site contingency plan for chemical spill procedures. Operating personnel can take action immediately to obtain safety clothing and equipment which will be needed when appropriate implementation direction is given through the responsible Enviromental Group.

The list of attached references describe details for safety considerations and the site contingency plan for chemical/hazardous waste spill continencies.

Gary Crosby

GAC/saj/X55219

cc: Deputy Project Director
Environmental Group Manager

References

1. Pan Am O&M Procedure "Chemcial Waste and Disposal Procedure" OP-24-WW-05-01.

2. Pan Am Safety Operating Procedure for Hazardous Material Control

3. NASA/JJ Plant Engineering Division Management Issuance No. 3900. 03A - "Division Action Plan for Fire, Explosion, Escaping Gas, Chemical Accident, and/or other Emergency Situation" July 1, 1986.

4. JSC Emergency Preparedness Plan, Annex A October, 1985; "Fire, Explosion, Escaping Gas, and Chemical Accidents Plan."

5. JSC 20728 Attachment D Environmental Contingency Plan and Emergency Procedure. (Especially pp D-19 thru D-31 & Appendix A) This plan is located around the site in enclosures for weather protection.

ATTACHMENT 4

INITIATION OF NARRATIVE ENTRIES

IN BLDG.223 LOG BOOK

MEMORANDUM

TO:	DIVISION	LOCATION	DATE:
			23 JANUARY 1987
PROJECT DIRECTOR	AD	PMOH	FROM: MANAGER UTILITIES OPERATIONS
THRU: DEPUTY PROJECT DIRECTOR			REFERENCE:

SUBJECT: B223 Operations Review Meeting 1-16-87 - Action Item Status

Operators have been instructed to make narrative type entries in the B223 log book. This log book is kept at the Operator's desk with a list of items to be checked fastened inside the front cover of the log. Operators have been instructed to make an inspection of B223 at least twice a shift when the system is not in blowdown treatment status. We will also direct the Operators to make a complete inspection of the B223 facility after it has been setup for the start of blowdown treatment.

The sampling of chemicals for determining the pumping rate will be done as required when the blowdown treatment system is in operation. The sampling is required just after startup and any time an adjustment is made to one of the pump rate settings for one of the chemical injection pumps.

A stainless steel apparatus for obtaining chemical grab samples has been built. However, we are still trying to obtain an easy to read graduated glass cylinder to use with the new apparatus. In the meantime, we will continue to use the old grab sample apparatus or a temporary glass cylinder for the new apparatus.

I believe our Operators will cooperate to the best of their ability to ensure that we will operate the B223 facility safely and effectively.

Gary A. Crosby

GAC/saj/55219

cc: Jim Fowler
John Pohler
Post B223

Att. 4

MEMORANDUM

BLDG 223 INSPECTION LOG

RECORD

7530-00-222-3525

FEDERAL SUPPLY SERVICE

THIS LOG IS TO REMAIN IN BLDG. 223

THESE ARE SUGGESTED AND REQUESTED AREAS TO BE INSPECTED AND LOGGED EACH SHIFT:

1. PH METER FACTORS
2. WET WELL 1 & 2 LEVEL - PH & PUMP OPERATTION
3. CONTROL AIR COMPRESSOR STATUS
4. AIR BLOWER STATUS
5. CHEMICAL TREATMENT PUMP INSPECTION
6. HEAT TRACE INSPECTION
7. CHEMICAL STORAGE CONTAINMENT AREA VALVE INSPECT.
8. CHEMICAL STORAGE TANK INSPECTION
9. CHEMICAL STORAGE TANK LEVELS (EACH DAY SHIFT)
10. ANY MALFUNCTIONS/SRT'S,ECT. ARE TO BE LOGGED AND REPORTED TO THE CH/OPR AND SUPERVISOR.

1-26-87 2300-to 0700 Walker

1 Acid Ph-2.50 Flocc-Ph-4.50 Finel Ph-8.40

2-Wet Well Level 6' Gauge Pumping Down for Alpha

3-CAC OK

4-#1 Blower on #2 O/S

5-#3 Acid Pump Has S.R.t All others OK

6-Heat trace OK

7-Containment Area Drain Valve Needs Rep.

8-Chem. storage tank OK (Maint on ins. Being Performed)

9 Sulfite ½ caustic Acid ?

10 SRt's Acid Pump #3 #2 Blower O/S
#1 Lift Pump O/S Lift Pumps 2 & 4 O/S Repairs

0300 checked above No change

1st. 1-27-87 0700-1500 Garry

Blow Down off at 223

① Acid P.H. 2.4 Flock. 4.2 Final 8.4

② Wet Well level 2 feet

③ CAC O.K

④ Blowers 1+2 O.K. Running No. 1 Blower

⑤ All pumps O.K. No. 1 Acid pump has SRt. Noisy

⑥ Heat trace on + OK

⑦ All o.K. but Drain Valve Needs Repairing

⑧ Storag tanks all OK

⑨ Sulfite ½ full Acid 4'2" from top Caustic 6'3" from top.

⑩ Raw lift pump No. 2 Ready for Service Blower No. 2 Blower back in service.

1/29/87 2300- 0700 Lumley

B-223. B.D. off!

1. P.H. Acid - 2.85 Floc - 4.25 outfall 8.40
2. Wet well level 3' on sight.
3. Gas. ok.
4. Blowers 1+2 have S.R.T. tags on them maint. check motor holding & pumping properly.
5. Chemical pumps Acid pump S.R.T. Noisy Acid pump #4 S.R.T. Not pumping properly Not pumping enough.
6. Heat Tracer ok.
7. Containment Area. Drain valves are closed But did leak @ last rain. Needs Repairs
8. Chemical Storage Tanks ok.
9. Chemical tank Storage levels: Sulfite 1/2 full. Caustic & Sulfite need indicator level of some sort?
10. Malfunctions S.R.T. on Blower # 1+2 S.R.T. on Acid pump # 3 Noisy S.R.T. on Acid pump # 4 Not pumping properly. Raw Lift pump #1 tag # 4332 Modifications Raw Lift pump # 2 Tag # 4216 - Repairs Raw Lift pump #4 Tag # 3900 + 4139 Repairs Wet Well Modifications going on, on Air Lines + ect.

B-223 @ 01:45 Secured gas engine Wet well empty.

ATTACHMENT 5

Pan Am World Services, Inc.
Plant Maintenance & Operation - Houston
P.O. Box 58238
Houston, Texas 77258

16 January 1987

National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, TX. 77058

ATTENTION: Technical Manager, JJ

SUBJECT: Contract NAS 9-17750 - Building 223 Operations

Dear Sir:

As a part of our investigation into the acid spill in late December 1986 at B-223, we are pursuing improvements in both procedural and physical facility areas. Mr. Crosby has been tasked to review existing procedures and develop/implement any identifiable changes which will provide a more comprehensive and failsafe operation. These actions are currently underway in concert with the development of an expanded training program which will document operator proficiency in operations relating to the B-223 facility.

In the case of physical facilities, we have identified the following as potential improvements:

1. Construct a containment berm around the outside of the pump house.
2. Add a floor drain (with valve) in the pump house which dumps into the wet well.
3. Provide a day tank in each of the acid and caustic systems.
4. Provide remote reading level gauges for both acid and caustic tanks.
5. Install quick connect caps on containment area drain lines.
6. Replace all acid and caustic piping with appropriate stainless steel lines, fittings and valves.
7. Replace electric driven pumps with air driven pumps to eliminate the hazard should water flush be necessary in case of a spill. If that is not possible, improve the electrical system.
8. Replace the pump house door with one that contains an elongated window for checking pump house pumps and floor areas before entering.

9. Install a pH monitor in the wet well and at manhole ""M" with an alarm.

10. Install a flowmeter in the B-24 cooling tower discharge line to meter and record flow from the facility.

In view of JN's involvement in also making/recommending improvements to the B-223 systems, please advise if we should pursue any of the above tasks as a part of our maintenance responsibilities.

Yours truly,

J.F. Golden
Project Director

JFG/jb

ATTACHMENT 6

REQUEST FOR KYNOR MATERIAL

PURCHASE ORDER

Pan Am World Services, Inc.

PHONE: 713-483-6311
713-483-6367

PAN AM
WORLD SERVICES, INC.
P.O. BOX 58938
HOUSTON, TEXAS 77258

Purchase Order No. 86-3105

Req. No. 79440

Bldg. 223

TO A.G. BAILEY COMPANY
P.O. BOX 26287
HOUSTON, TEXAS 77087

641-6056

Work Order	Charge Number	Buyer	Date	Confirming To
68137	AU301	IRENE	8-19-86	
Craft	**Delivery Date**	**Via**	**FOB**	**Terms**
MI/ROBERTS	8-22-86	UPS AIR & O.T.	SP	NET

Item	Quantity	Unit	Nomenclature	Unit Cost	Total Cost	Qty Rec'd
1	2	EA	SPARE PARTS KITS KYNOR MATERIAL -	76.57	153.14	2
2	5	EA	TEFLON DIAPHRAGMS PART NO.#P47193	12.95	64.75	5
3	30	EA	O RINGS-VITON PART NO. #PXA3D343	.29	8.50	30
					226.39	

PLEASE MAKE ALL UPS AND TRUCK DELIVERIES
TO BLDG. 325, NASA, JSC

Contract No NAS 9-16395 and Purchase Order No. must appear on all invoices, packing slips, packages units, packing lists, correspondence and other related papers. Further instructions or changes are not binding on Buyer unless evidenced by Buyer's duly authorized Purchase Order Change Notice signed by The Purchasing Agent.

Acceptance instructions, together with the conditions on the reverse side of the Purchase Order are made a part hereof, to which the seller agrees by acceptance of this order.

Tax Exempt

By _____

Storekeeper _____

Date 8-21-86

Rec'd By _____

Date 8-21-86

PAA 100-19

PAN AM MATERIAL REQUISITION

PREFIX 79440

VENDOR

VENDOR CODE

NAME

ADDRESS

CITY

STATE ZIP

USE REVERSE SIDE FOR COMPLETE PURCHASING DATA

PURCHASE ORDER NO ← SHOW ON ALL DOCUMENTS	P O DATE	SHIP VIA	FOB POINT	DELIVERY DATE	FOLLOW UP DAT

DISCOUNT TERMS	QUOTED BY	BUYER NO.	TYPE ORDER ☐ 1. 1171 2. 1348 3. PAN AM	VENDOR TEL. NO

ALL REQUISITIONED ITEMS APPEARING BELOW MUST HAVE THE SAME COST CODE NO.

DELIVER TO	PROPERTY CODE	DATE PREPARED	DATE REQUIRED	MRSO PMTO NO	COST CODE NO	CRAFT CODE

ITEM	QTY.	UNIT	VENDOR PART NO., NOUN AND DESCRIPTION	ESTIMATED UNIT COST	JULIAN DATE AND NUMBERS

FOR WALLACE & TIERNAN
Metering Pumps
Series 44-211
MAX. DISCH. PSIG 125

JUSTIFICATION

I hereby certify and have confirmed that the above it will not be made available to Pan Am through Governm supply sources in time to meet the required need date

Logistics Division Representative

REQUISITIONER	APPROVAL	APPROVAL	APPROVAL

FORM 24 1 (Feb 75)

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLE T

Pan Am World Services, Inc.

PURCHASE ORDER

Purchase Order No. 85-3499

PHONE: 713-483-6311
713-483-6367

PAN AM
WORLD SERVICES, INC.
P.O. BOX 58938
HOUSTON, TEXAS 77258

Req. No. 72235

Bldg. _____

TO

COBLER SALES & SERVICE
2141 Regal Parkway
Euless, TX 76040

817-354-7411

Work Order	Charge Number	Buyer	Date	Confirming To
83335	AU301	Caroline	9-09-85	
Craft	**Delivery Date**	**Via**	**FOB**	**Terms**
J/Young	9-18-85	Best Way	S.P.	Net

Item	Quantity	Unit	Nomenclature	Unit Cost	Total Cost	Qty Rec
1	4	EA	PUMP HEAD KIT, #U24206 (KYNAR MATERIAL)	217.19	868.76	4

PLEASE MAKE ALL UPS AND TRUCK DELIVERIES
TO BLDG. 325, NASA, JSC

Contract No. NAS 9-16395 and Purchase Order No. must appear on all invoices, on package units, packing lists, correspondence and other related papers. Further instructions or changes are not binding on Buyer unless evidenced by Buyer's duly executed Purchase Order Change Notice signed by The Purchasing Agent.

The above instructions, together with the conditions on the reverse side of the Purchase Order are made a part hereof, to which the seller agrees by acceptance of this order.

Tax Exempt

By _____

Storekeeper _____

Date 10-11-85

Rec'd By _____

Date 10-9-85

PAA 100-19

PAN AM MATERIAL REQUISITION

PREFIX 72235

VENDOR

VENDOR CODE

NAME PENNWALT
ADDRESS
CITY
STATE ZIP

USE REVERSE SIDE FOR COMPLETE PURCHASING DATA

PURCHASE ORDER NO ← SHOW ON ALL DOCUMENTS	P O DATE	SHIP VIA	FOB POINT	DELIVERY DATE	FOLLOW UP DATE

DISCOUNT TERMS	QUOTED BY	BUYER NO	TYPE ORDER (1 TITE, 2 TMR, 3 PAN AM)	VENDOR TEL NO
			☐	

ALL REQUISITIONED ITEMS APPEARING BELOW MUST HAVE THE SAME COST CODE NO.

DELIVER TO	PROPERTY CODE	DATE PREPARED	DATE REQUIRED	MRSO PMTO NO	COST CODE NO	CRAFT CODE
		8-25-85	9-15-85	~~[illegible]~~ 36338	AU301	MI

ITEM	QTY	UNIT	VENDOR PART NO., NOUN AND DESCRIPTION	ESTIMATED UNIT COST	JULIAN DATE AND NUMBERS
2	4	EA	PUMPHEAD KIT # U24206	217.15	
			MAT MUST BE KYNAR		
			NO SUB		
			FOR SERIES #44 PUMP		

JUSTIFICATION

FOR ~~Acid~~ PUMP 223 White

I hereby certify and have confirmed that the above items will not be made available to Pan Am through Government supply sources in time to meet the required need date

Logistics Division Representative

SIGNED	APPROVAL	APPROVAL	APPROVAL
Jones	B.O. Young	B.O. Young	[signature] 8/27/85

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

PURCHASE ORDER

Pan Am World Services, Inc.

PHONE: 713-483-6311
713-483-6367

PAN AM
WORLD SERVICES, INC.
P.O. BOX 58938
HOUSTON, TEXAS 77258

Purchase Order No. 84-3034

Req. No. 65316

Bldg. 223

TO WALLACE & TIERNAN DIVISION PENNWALT CORP.
c/o A. G. BAILEY CO.
P.O. Box 26287
Houston, TX 77087

641-6066

Work Order	Charge Number	Buyer	Date	Confirming To
50152	KH C50152	Caroline	9-10-84	Brad
Craft	**Delivery Date**	**Via**	**FOB**	**Terms**
MF/Mohsen	10-17-84	UPS	S.P.	Net

Item	Quantity	Unit	Nomenclature	Unit Cost	Total Cost	Qty Rec'd
1	6	EA	P/N U23268 (Complete Kit)	127.29	763.74	
2	6	EA	P/N U25948 (Complete Kit)	62.49	374.94	
3	10	EA	P/N P49625	6.55	65.50	
4	4	EA	P/N P49015 SPRING	6.77	27.08	
5	12	EA	P/N PXB39234 ¼" NPT/PVC	1.24	14.88	
6	4	EA	P/N P47194 BUTTON	3.73	14.92	
					1,261.06	

PLEASE MAKE ALL UPS AND TRUCK DELIVERIES
TO BLDG. 325, NASA, JSC

Contract No. NAS 9-16395 and Purchase Order No. must appear on all invoices, BL's, package units, packing lists, correspondence and other related papers. Further instructions or changes are not binding on Buyer unless evidenced by Buyer's duly executed Purchase Order Change Notice signed by The Purchasing Agent.

The above instructions, together with the conditions on the reverse side of the Purchase Order are made a part hereof, to which the seller agrees by acceptance of this order.

Tax Exempt

By Caroline Brennan
Buyer

Storekeeper

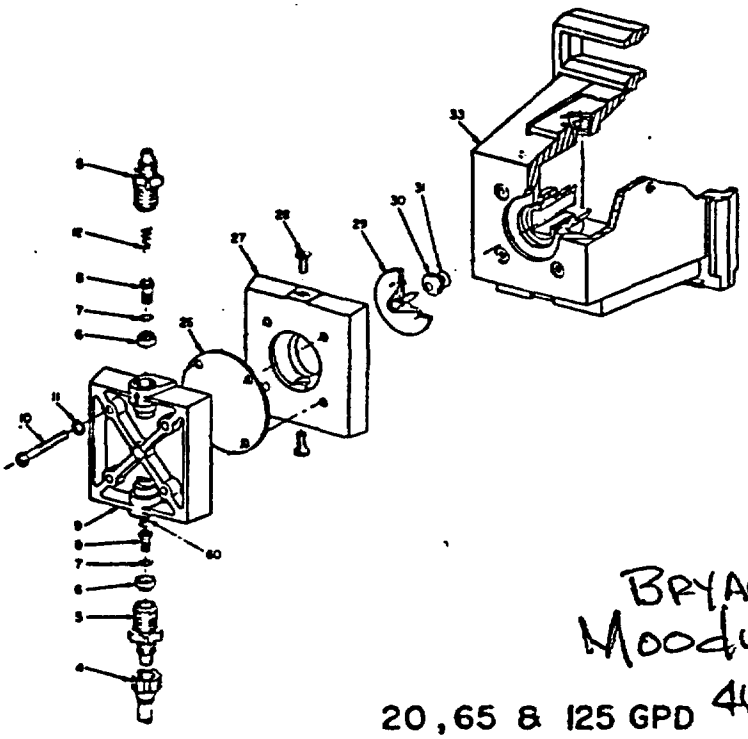
Date

Rec'd By

Date

PAA 100-19

HEAD REPLACEMENT KIT U 24206 (KYNAR)



U 23492
~~U 22613~~

BRYAN
Moody Bros
462-8544

20, 65 & 125 GPD

KEY NO.	PART NO.	QTY.	DESCRIPTION	KEY NO.	PART NO.	QTY.	DESCRIPTION
4	P. 50106	1	UNION NUT	11	P 38740	4	#10 WASHER (S.S.)
5	P 49625	2	VALVE HOLDER	12	P 40470	1	ANTI-SYPHON SPRING
6	PXA40407	2	VALVE SEAT		OR		
7	PXA30343	2	O-RING (VITON)	■	P 42728	1	LIGHT SPRING
			3/16"ID x 5/16"OD	26	P 47193	1	TFE DIAPHRAGM
			UNIFORM SIZE NO. 008	27	P 47887	1	TANDEM DIAPHRAGM ADAPTER
8	PXA40419	3	POPPET STEM	28	P 43370	2	SEELSKREW
9	P 49627	1	PUMP HEAD				1/4-20 x 1/2" LG. (S.S.)
10	P 47190	4	MACH.SCREW (PAN.HD.,S.S.)	29	UXC11916	1	DIAPHRAGM
			#10-24 x 2-1/8" LG.				

NOTE: Refer to instruction book furnished with pump for disassembly/reassembly procedures necessary to replace the above parts.

■ P 42728 is used with 65 and 125 GPD Pumps only when P 40470 anti-syphon spring is not used.

WHEN THIS OVERHAUL IS COMPLETED, PROTECT YOUR INVESTMENT AND MINIMIZE FUTURE DOWN-TIME BY PLACING THE EQUIPMENT ON A SCHEDULED ONE YEAR PREVENTIVE MAINTENANCE CYCLE. ORDER A PREVENTIVE MAINTENANCE KIT, U 25948, FROM YOUR EQUIPMENT SUPPLIER NOW AND KEEP IT ON HAND.

WARNING: THIS EQUIPMENT MAY HANDLE HAZARDOUS MATERIALS SUCH AS ACID OR CAUSTIC WHICH CAN CAUSE SEVERE BURN TYPE INJURIES. WHEN HANDLING ANY HAZARDOUS MATERIAL, USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL AND POSSIBLE PERSONAL INJURY. USE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION. REFER TO SAFETY PRECAUTIONS OF THE MANUFACTURER OF THE HAZARDOUS MATERIAL FOR FURTHER IMPORTANT DETAILS AND PRECAUTIONS.

WARNING: TO PREVENT POSSIBLE PERSONAL INJURY FROM BEING SPRAYED WITH LIQUID UNDER PRESSURE, DO NOT DISCONNECT DISCHARGE TUBE/PIPE WITHOUT FIRST RELIEVING PRESSURE AND DRAINING DISCHARGE LINE. SEE INSTRUCTION BOOK FOR DETAILED GUIDANCE.

WALLACE & TIERNAN DIVISION
PENNWALT CORPORATION
25 MAIN STREET
BELLEVILLE, NEW JERSEY 07109

WALLACE & TIERNAN
PENNWALT
EQUIPMENT & CHEMICALS
HEALTH PRODUCTS

Yellow / File

PAN AM WORLD SERVICES, INC. 87-8A

INCIDENT REPORT

DATE: 2-6-87 TIME: 1305 p.m.

LOCATION: Behind B24 Cooling Tower

TYPE OF INCIDENT: Chemical spill

BRIEF DESCRIPTION: Contractor (Spraying Services Inc.)
While spraying cooling tower for fungus, left the water hose running in chemical tank.

REPORTED BY: Mr Hoffpowier

WITNESSES: Audrey Hall, Paul Riley

NASA REPRESENTATIVE ADVISED: Don Moen TIME: 1315

M & O CONTRACTOR REPRESENTATIVE ADVISED: Catherine Balusek TIME: 1310

CIRCUMSTANCE THAT CAUSED INCIDENT: Contractor was filling tank containing fungicide with water for afternoon spraying. He forgot about it and went to lunch, leaving water on. At least 20-25 gallons of approxmately 3% solution of Bis (tri-n-butyltin) oxide was spilled.

CORRECTIVE ACTION TAKEN: Absorbal was spread over area, by contractor, and contrator & 2 PMOH laborers swept and scooped up absorbal and placed it into drums.

PROBLEMS ENCOUNTERED: Dye was not absorbed into ground no soil had to be removed.

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.)

ORIGINATOR: Catherine Balusek Catherine Balusek DATE: 2-6-87

DEPARTMENT HEAD: J.D. Fowler J.D. Fowler DATE: 2-9-87

MANAGER, M & O SERVICES: DATE:

FORM PAA-200-8 NASA-JSC

J.P. Kerrmann / Don Moen

PAN AM WORLD SERVICES, INC.

87-78A

INCIDENT REPORT

DATE: 8 October 1987 TIME: 1200 hours

LOCATION: B-223

TYPE OF INCIDENT: Chromate spill from B-223 sand bed.

BRIEF DESCRIPTION: Chromate sludge was being transferred from the chromate holding pits to the sand bed. The pump was not running - but the suction and discharge hose were in place allowing the system to syphon from pit to sand bed at a faster rate than water could be drained from sand beds. Approx. 50-75 gallons of chromate sludge overflowed into parking area

REPORTED BY: Una G. Ebanks

WITNESSES: None

NASA REPRESENTATIVE ADVISED: Don Moen, JJ12 TIME: 1215 hours

M & O CONTRACTOR REPRESENTATIVE ADVISED: J.D. Fowler, Pan Am TIME: 1200 hours

CIRCUMSTANCE THAT CAUSED INCIDENT: A smaller pump on the south side of the chromate reduction facility caught fire during a refuelling operation. (See separate incident report). The operator was involved with the fire and was not aware of the syphoning on the other side of the facility.

CORRECTIVE ACTION TAKEN: The chromate sludge was quickly contained and pumped back into the sand beds. The area was washed down with the rinse water being pumped onto the sand beds. Absorbent was then spread to dry the area and the absorbent was also placed on the sand beds.

PROBLEMS ENCOUNTERED: None

DOCUMENTATION: (LOGS, CHARTS, MANUALS, ETC.)

ORIGINATOR: DATE:

DEPARTMENT HEAD: J.D. Fowler J.D. Fowler DATE: 10/8/87

MANAGER, M & O SERVICES: DATE: 10-8-87

FORM PAA-200-8 NASA-JSC